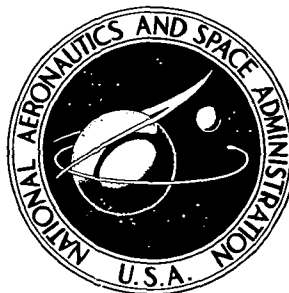


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NOISE GENERATED BY QUIET ENGINE FANS

II - Fan A

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and Edward G. Stakolich*

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SUMMARY

A significant effort within the NASA Quiet Engine Program has been devoted to acoustical evaluation at the Lewis Research Center noise test facility of a family of full-scale fans designed and built by the General Electric Company. This report, part II of a multipart series covering all the fans tested, documents the noise results obtained with fan A - a 1.5-pressure-ratio, 0.354-meter-per-second- (1160-ft/sec-) tip-speed fan. The fan is described and some aerodynamic operating data are given. Far-field noise around the fan was measured for a variety of configurations pertaining to acoustical treatment and over a range of operating conditions. Complete results of 1/3-octave band analysis of the data are presented in tabular form. Included also are power spectra and sideline perceived noise levels. Some representative 1/3-octave band data are presented graphically, and sample graphs of continuous narrow-band spectra are also provided.

INTRODUCTION

The NASA Quiet Engine Program is directed toward developing technology which has direct application in the alleviation of noise from subsonic commercial aircraft. The most tangible results of the program are demonstration high-bypass-ratio turbofan engines which, by the incorporation of such technology, are markedly quieter than currently available engines (ref. 1).

A significant effort within the Quiet Engine Program has been devoted to acoustical and aerodynamic evaluation of a family of full-scale component fans. The designs of these fans were chosen to develop a better understanding of the mechanisms of fan noise generation and to permit choosing ultimately a minimum-noise design for incorporation in the Quiet Engine. Three such fans were built, each designed to meet propulsion system requirements but varying significantly in aerodynamic design parameters which are

considered to be noise related. In addition, all fans possess the accepted low-noise features of being single stage, having no inlet guide vanes, having extended rotor-stator spacing, and having an appropriate vane blade ratio.

The three fans have been letter designated as A, B, and C. All three fans were designed and built by the General Electric Company. A comparative summary of their more pertinent design characteristics is given in table I. Of these, fan A is the second to have completed an extensive acoustical test program at the Lewis Research Center. This report documents the more significant noise data obtained in that program. Results obtained with fan B, the first fan tested, are given in reference 2.

Interpretation of the data is subject to the ultimate interests of the user; further, it is facilitated by a comparison of data among all fans tested, only one of which is being reported herein. For these reasons and to expedite dissemination of the data, no attempt is made at interpretation from any point of view, but rather emphasis is placed on completeness and convenience of format for all potential users.

FAN DESIGN CHARACTERISTICS

A complete discussion of the aerodynamic and mechanical design details of fan A is given in reference 3. Only a brief description of the more apparent features of the design is given here, as well as some details peculiar to the acoustical test setup.

Fan A, among the three fans in the program, is characterized generally as being a low-speed, high-aspect-ratio fan with a high number of blades. Its design characteristics are given in table I. The rotor blades are designed with an integral tip shroud. The fan flow is divided between the bypass duct and the core downstream of the fan rotor. An equal number of outlet guide vanes, as in the bypass duct, exist in the core duct, but at less than two-chord spacing. A cutaway-view illustration of a typical fan configuration for acoustical testing is shown in figure 1. The fan was shaft driven from the front, as shown. Also illustrated is wall acoustical treatment in the flow passages.

The fans were designed with sound-absorbing liners incorporated within the fan frame, that is, confined in axial extent approximately from a plane 41 centimeters (16 in.) upstream of the fan face to a plane 61 centimeters (24 in.) downstream. This is illustrated in figure 2. Also included is acoustical treatment on the core passage walls around the stator. Details of the kind and extent of the fan-frame treatment are given in reference 3.

For acoustical testing, the core flow was simply ducted aft and passed through a core nozzle sized to cause the hub portion of the fan to operate as closely to engine conditions as possible. To minimize emission of core-duct-generated noise, a core suppressor was installed as illustrated also in figure 2. The suppressor consisted of 1.626

square meters (17.5 sq ft) of 5.1-centimeter- (2-in. -) thick polyurethane foam held in place in the core-duct outer wall by a perforated metal facing sheet of 23-percent open area. Since the core jet flow represented about one-fifth of the bypass flow and its velocity was also less, the noise from the core jet flow was presumed to make a small contribution to the noise data compared with the bypass jet.

FAN PERFORMANCE

Extensive aerodynamic testing of the fan was conducted at the General Electric facilities in Lynn, Massachusetts, and the detailed results are given in reference 4. A performance map based on fan bypass flow is given in figure 3. The constant-speed lines shown are from the aerodynamic tests described in reference 4. For the tests in the noise facility, a minimal amount of aerodynamic instrumentation was used, from which the fan operating lines, shown in figure 3, were derived for the various nozzle areas employed.

ACOUSTICAL TEST PROGRAM

Configurations

The fan was run in a variety of configurations which varied regarding (1) the condition of the inlet, (2) the condition of the fan-frame treatment, (3) the condition of the bypass exhaust duct, and (4) the size of the bypass nozzle. The variations employed in each of these items and the terminology used are explained in the following sections.

Inlet. - The fan was run with the inlet in either a hard or a suppressed condition. The hard inlet was comprised of a bellmouth and a 103-centimeter- (40.5-in. -) long cylindrical inlet section mated to the fan frame. Alternately, an inlet suppressor employing three splitter rings was used in place of the straight section. The details of the inlet suppressor design have been reported in reference 5, which discusses also its use with another fan.

Fan frame. - The fan was run with the frame treatment both functioning and deactivated (by the use of adhesive-backed aluminum tape). These conditions were considered as being with or without fan-frame treatment and are referred to as the "soft" and "taped" fan-frame conditions, respectively. Two taped arrangements were employed. The first, denoted as taped, deactivated all the fan-frame treatment. The second, denoted as partially taped, deactivated only the acoustical treatment between the rotor and the stator. Under all conditions, the fan-frame treatment in the core passage remained functional.

Exhaust duct. - The fan was run in both the hard and suppressed exhaust conditions. The hard exhaust condition refers to the bypass duct with no sound-absorbing treatment. Alternately, a bypass-exhaust-duct suppressor with a splitter was employed. The arrangement and dimensions of the suppressor are given in figure 2. The absorbing material was comprised of 0.95-centimeter - (3/8-in. -) thick aluminum hexagonal-cell honeycomb faced with 0.051-centimeter - (0.020-in. -) thick perforated aluminum sheet with 8 percent open area in the walls and $4\frac{1}{2}$ percent in the splitter.

Nozzles. - Three separate bypass exhaust nozzles were used. These are generally referred to as nominal, large, and small. Preliminary fan runs were made for purposes of trimming the nozzles to size to ensure that the fan operating lines achieved during acoustical testing were as close as possible to those of the aerodynamic tests which were conducted by the General Electric Company. The nominal nozzle had an exit area of 1.188 square meters (1842 sq in.). The small and large nozzle areas deviated approximately 7 percent from nominal.

The geometric variables of the nozzles which relate to jet noise generation are given in table II. The bypass-exhaust-nozzle exit plane was situated upstream of that of the core, and the axial distances between the two exit planes are also given in table II.

Data Acquired

A tabulation of the configurations for which acoustical data are being reported is given in table III. Each configuration was run at various speeds. For every test, far-field noise was measured. In one case, the principal purpose for the test was to acquire inlet-duct acoustic probe measurements. This is so denoted in table III. These data are included because they reflect effects of the instrumentation introduced into the air streams. The probes are described in reference 2. No acoustical data obtained by means of probes are presented in this report.

Most data were obtained under wind conditions which were well within the operating limits described in the section Test Procedure. One set of data, however, was taken under conditions where the mean wind speed was at the limit, 5.1 meters per second (10 knots), with occasional gusts to 7.65 meters per second (15 knots). These data are qualified as such in table III, and since the test was rerun under better conditions, both sets of the data are included to permit examination of wind effects.

DATA ACQUISITION AND ANALYSIS

Test Site

The acoustical tests were conducted at the outdoor full-scale-fan acoustic test facility at the Lewis Research Center, shown in figure 4. A plan view of the area is given in figure 5. The facility abuts the 10- by 10-Foot Supersonic Wind Tunnel drive motor building and utilizes the wind tunnel drive motors as the fan prime mover through a speed-increasing gearbox. The fan pedestal was located sufficiently far from the building to permit far-field microphones on a 30.5-meter - (100-ft-) radius arc every 10° , from 10° to 160° , with respect to the fan inlet axis. The 120° and 160° microphone distances were actually greater than 30.5 meters (100 ft) by 0.9 and 1.4 meters (3 and 4.5 ft), respectively, because of the presence of a sidewalk through the microphone field. The fan axis was 5.8 meters (19 ft) from the ground, and the microphones were all in the same horizontal plane. The ground plane was asphalt pavement. The exterior wall of the drive building was treated with sound-absorbing material to minimize reflections to the microphone array. There were no other major reflecting surfaces in the near vicinity of the site.

It should be noted, for the data reported herein, that the center of the microphone arc intersected the fan assembly axis near the nozzle exit plane. The actual distance of the center of the arc from the fan component, which is the more customary arc center, was 3.5 meters (11.7 ft) (fig. 5). This situation resulted from the evolutionary process of developing the test facility and is not significant in itself. Care, however, should be exercised in making detailed comparisons of the data, particularly one-to-one angular comparisons, with data obtained from assemblies whose fan component is at the center of the arc.

Test Procedure

The instrumentation and data recording system had a flat response over the frequency range of interest (50 to 20 000 Hz). Prior to the set of tests for each configuration, a pistonphone signal was impressed on each far-field microphone for absolute calibration of each channel. Data signals were FM recorded from all channels simultaneously on magnetic tape. Air temperature, pressure, and relative humidity were logged before and after testing; and wind velocity and direction were logged at each data point. To minimize problems with ambient noise and unfavorable wind conditions, tests were usually conducted in the early morning hours prior to sunrise, when weather conditions were calm and stable. No acoustical data were taken under conditions of fog or precipitation or with steady wind or gusts in excess of 5.1 meters per second (10 knots).

Corrected fan speeds were used which corresponded to 60, 70, 80, and 90 percent of standard-day cruise design speed. For this reason, the fan physical speeds employed varied from day to day with ambient temperature variations. The 60- and 90-percent speed points approximately represent fan operation for a four-engine aircraft at approach and takeoff conditions, respectively. Generally, the fan was run over the speed range three times, and three nonconsecutive 100-second noise samples for each speed were recorded.

One-Third-Octave Band Analysis

Data reduction system. - Each of the three samples for a given speed was reduced separately by using a 1/3-octave band analyzer, and the resulting sound pressure levels were arithmetically averaged. The analysis system employed a 4-second averaging time and stepped sequentially through the angles from 10° to 160° . The 4-second averaging time was a compromise to accommodate all angles within a 100-second sample while preserving analyzer repeatability. All three-sample averages for each frequency and angle were examined statistically, and the standard deviations of the great bulk of the data were less than 1 decibel.

Adjustments to measured data. - Results of 1/3-octave band analysis yielded data taken under ambient conditions of the test day at the microphone locations. The data were referred back to the source (i. e., the effect of atmospheric absorption was removed) by computing atmospheric absorption for the test conditions over the propagation path and adding it to the data.

Atmospheric absorption was computed by using continuous frequency-dependent functions derived from reference 6. The application procedures set forth in reference 6 were not used, as they presuppose a spectrum typical of engine jet noise. In the present case, the general shape of the measured spectrum was used to obtain an integrated value of absorption for each 1/3-octave band.

For reference purposes, and to permit extrapolation of data provided herein to other distances, a tabulation of standard-day atmospheric absorption values is given in table IV. These values are based on the assumption of a flat 1/3-octave band spectrum, and therefore are not precisely those computed for any real spectra. However, the values are nominally those employed in the data adjustments and are sufficiently accurate for estimating noise projections to other distances.

The data referred to the source were adjusted to constant radius and acoustic power, and directivity index calculations were made. No directivity index data referred to the source are presented herein, but they may be readily derived from the data (see the section DATA PRESENTATION). For power calculations, the sound pressure levels were presumed to be axisymmetric and were integrated over an enclosing hemisphere.

Implicit in this procedure was that the ground plane was perfectly reflective in the sense that acoustic intensity was doubled in the far field. No account was made of signal interference effects at the microphones because of ground reflections.

Using data referred to the source, calculations of atmospheric absorption for a standard day of 15° C (59° F) and 70-percent relative humidity were made and the data so adjusted to standard-day conditions. All tabulated sound-pressure-level data reported herein are adjusted to standard-day conditions.

A more thorough discussion of the material presented in this section and the computer programs employed are given in reference 7.

Narrow-Band Analysis

Continuous narrow-band spectral analyses of the noise signals were also performed. The analysis system employed a 20-hertz constant-bandwidth filter over the frequency range from 0 to 10 000 hertz. The narrow-band spectra were not adjusted in any way and reflect the signals at the microphones under test-day conditions.

Narrow-band spectra constitute a highly detailed examination of the data and may reveal features which are otherwise not evident but which aid in understanding the noise-generating mechanisms. In this sense, they reflect a specialized interest in the data and do not share in the wide practical utility of 1/3-octave band data. For this reason, and considering the simple nature of the source, only a limited number of narrow-band spectra are presented herein as general information.

DATA PRESENTATION

Tabulations

All standard-day 1/3-octave band data on a 30.5-meter (100-ft) arc which were obtained from the acoustical test program are presented in tabular form. Table III lists the fan configurations for which data are presented herein. The actual noise data appear in tables V to XIV inclusive, in increasing order of configuration number. Each table is identified by configuration number and speed and contains descriptive information about the configuration.

The principal table entries are standard-day sound pressure levels (SPL referred to 0.00002 N/sq m) in each 1/3-octave band for each angle on a 30.5-meter (100-ft) radius. Overall sound pressure levels which were computed from the 1/3-octave band data are also given.

Using the data referred to the source, calculations of power level (PWL) were made by multiplying the sound intensity at each angle by its respective incremental area on the surface of a hemisphere and summing the increments of power so obtained (ref. 7). Radiation through axis areas for which no data were obtained was neglected. Power levels are presented in the tables referred to 10^{-13} watts (0.1 pW).

Each power level has associated with it an average SPL which is the sound pressure level produced by a source emitting the same acoustic power but radiating uniformly in all directions. For the individual frequency bands, average SPL may be used to quickly compute directivity index. Since average SPL is referred to the source and the table entries include standard-day atmospheric absorption, directivity index can be obtained by subtracting atmospheric absorption for 30.5 meters (100 ft) (table IV) from the average sound pressure level and subtracting the result from the table entries at all angles. There is no direct way to compute the directivity index for the overall sound pressure levels using the data provided.

For all cases, projections were made to a sideline 61 meters (200 ft) from and parallel to the fan axis, and perceived noise levels in PNdB were computed in accordance with reference 8. These perceived noise levels are provided in the tables and permit a quick and practical comparison, among all the data, of the relative noise generated. In addition, sideline perceived noise levels are provided at 113 meters (370 ft) for the approach-speed case (60 percent of design speed) and at 305 meters (1000 ft) for the takeoff-speed case (90 percent of design speed). These distances typify aircraft altitudes at FAA-regulated noise certification locations (ref. 8), and the data indicate generally the community noise levels to be expected from the fan compared with FAA regulations. Note that the data provided are for a single fan and that the perceived noise levels for n fans may be obtained very closely by adding $10 \log n$ to the single-fan values.

Graphical Data

One-third-octave band data. - For many configurations, the 1/3-octave band data are qualitatively similar. For this reason, data from only selected configurations are presented graphically to illustrate general features. Configurations 201 to 206 are in this category; and, for these, the data of configuration 206 are presented in figure 6 as typical. Configurations 207, 208, and 210 represent permutations of inlet and exhaust suppressors; and the data of configuration 208 are presented in figure 7 to illustrate typical suppressor effects for all these configurations. Detailed comparisons among different configurations should be made by using the tabulated data. Graphical data presentations consist of standard-day 1/3-octave band sound pressure levels at a 30.5-meter (100-ft) radius for all angles and speeds.

Narrow-band data. - Because of their special nature, only representative samples of narrow-band spectra are presented to illustrate their general character. Spectra at or near the peak noise angles, front and rear, at 60- and 90-percent speeds have been selected. These are presented for configurations 206 and 208 in figures 8 and 9, respectively.

CONCLUDING REMARKS

A program of noise tests with fan A has been completed at the Lewis Research Center. The fan is characterized generally as having a low tip speed and 40 high-aspect-ratio blades. It is one of three full-scale fans built under the NASA Quiet Engine Program, each of which varies significantly in design characteristics which may be noise related.

Acoustical tests were conducted over a range of aerodynamic operating conditions and with various arrangements of suppressive liners. Complete far-field noise results obtained in the tests are presented without interpretation. The data are presented in tabular form in a format intended to be useful to the majority of interested users. The presentation of these results is part of a continuing program directed toward a better understanding of the mechanisms of fan noise generation and the alleviation of noise from turbofan propulsion systems.

Lewis Research Center,
National Aeronautics and Space Administration,
Cleveland, Ohio, March 15, 1974,
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TABLE I. - DESIGN CHARACTERISTICS OF FANS A, B, AND C

Characteristic	Fan A	Fan B	Fan C
Corrected rotor tip speed, m/sec (ft/sec)	354 (1160)	354 (1160)	472 (1550)
Inlet hub/tip radius ratio	0.465	0.465	0.360
Rotor inlet tip diameter, m (in.)	1.86 (73.354)	1.86 (73.354)	1.73 (68.300)
Corrected airflow, kg/sec (lb/sec)	431 (950)	431 (950)	415 (915)
Inlet corrected specific flow, kg/sec/sq m (lb/sec/sq ft)	202 (41.3)	202 (41.3)	202 (41.3)
Number of rotor chords axially separating rotor and outer outlet guide vanes	2.0	2.0	2.0
Number of rotor chords axially separating rotor and inner outlet guide vanes	1.25	1.25	1.25
Bypass-portion total pressure ratio	1.50	1.50	1.60
Hub-portion total pressure ratio	1.32	1.43	1.49
Bypass ratio	5.6	5.4	5.0
Rotor aspect ratio	2.32	1.71	2.09
Rotor solidity:			
Outside diameter	1.45	1.30	1.40
Inside diameter	2.50	2.16	2.45
Number of rotor blades	40	26	26
Number of outer outlet guide vanes	90	60	60
Number of inner outlet guide vanes	90	60	60

TABLE II. - NOZZLE GEOMETRY

[Stator exit annulus area, 1.432 sq m (2220 sq in.).]

Dimension	Bypass nozzle			Core nozzle
	Nominal	Large	Small	
Area, sq m (sq in.)	1.188 (1842)	1.268 (1966)	1.103 (1710)	0.319 (494)
Outside diameter, m (in.)	1.654 (65.11)	1.783 (70.19)	1.631 (64.20)	0.861 (33.91)
Annulus height, m (in.)	0.271 (10.67)	0.283 (11.16)	0.257 (10.10)	0.141 (5.54)
Axial distance (bypass exit plane to core exit plane), m (in.)	0.613 (24.13)	1.044 (41.12)	0.642 (25.26)	-----

TABLE III. - ONE-THIRD-OCTAVE BAND FAR-FIELD NOISE DATA PRESENTED

[Core area, 0.319 sq m (494 sq in.).]

Configuration	Configuration description						Purpose of test	Table
	Inlet	Fan frame	Exhaust	Bypass nozzle	Bypass area			
					sq m	sq in.		
202	Hard	Taped	Hard	Small	1.103	1710	Far-field noise	V
203	↓	Taped	↓	Nominal	1.188	1842		VI
204		Partially taped		Nominal	1.188	1842		VII
205		Taped		Large	1.268	1966		VIII
a, b206		Soft		Nominal	1.188	1842		IX
c206	↓	↓	↓	↓	↓	↓		X
207	Soft	↓	↓	↓	↓	↓		XI
a, b208	Soft	↓	Soft	↓	↓	↓		XII
210	Hard	↓	Soft	↓	↓	↓	XIII	
210	Hard	↓	Soft	↓	↓	↓	Inlet-duct noise	XIV

^aData presented graphically also (figs. 6 and 7).

^bSamples of narrow-band analysis also presented (figs. 8 and 9).

^cData with marginal wind conditions.

TABLE IV. - STANDARD-DAY ATMOSPHERIC ABSORPTION

[Computed for a flat 1/3-octave band spectrum; temperature, 15° C (59° F); relative humidity, 70 percent.]

Band center frequency, Hz	Per 100 meters (300 ft)	Per 305 meters (1000 ft)	At 30.5 meters (100 ft)
	Attenuation, dB		
50	0.0	0.1	0.0
63	↓	↓	↓
80	↓	↓	↓
100	↓	↓	↓
125	.1	.2	↓
160	↓	.2	↓
200	↓	.3	↓
250	↓	.4	↓
315	.2	.5	↓
400	.2	.6	.1
500	.2	.7	↓
630	.3	.9	↓
800	.4	1.2	↓
1 000	.5	1.5	↓
1 250	.6	1.9	.2
1 600	.8	2.4	.2
2 000	1.0	3.1	.3
2 500	1.4	4.2	.4
3 150	1.8	5.6	.6
4 000	2.5	7.7	.8
5 000	3.6	11.0	1.1
6 300	5.1	15.6	1.6
8 000	7.4	22.5	2.2
10 000	10.6	32.2	3.2
12 500	15.1	46.0	4.6
16 000	21.4	65.2	6.5
20 000	30.3	92.4	9.2

TABLE V. - NOISE OF FAN A CONFIGURATION 202 (HARD INLET, TAPED FAN FRAME, HARD EXHAUST, SMALL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(a) Percent of design speed, 60; fan physical speed, 2113 rpm; fundamental blade passage frequency, 1408 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	71.3	69.3	70.9	70.4	70.9	71.8	71.3	72.4	72.6	72.9	73.8	75.3	76.8	76.6	78.6	80.8	74.3	121.7
63	71.3	71.1	69.9	69.4	70.3	71.3	70.4	70.1	70.8	71.9	73.8	75.2	77.1	78.8	79.4	82.2	74.6	122.0
80	70.9	70.8	68.2	68.2	68.9	70.9	70.6	71.3	72.4	73.9	75.6	78.2	79.6	81.4	81.4	83.5	76.4	123.8
100	72.4	72.1	72.7	72.7	71.8	72.3	73.9	74.9	75.9	77.1	78.8	80.9	81.3	83.1	83.9	84.7	78.7	126.1
125	75.5	77.1	77.7	76.0	76.3	75.8	77.3	77.5	78.6	78.8	80.3	81.6	81.1	82.0	83.5	82.9	79.5	126.9
160	76.2	77.0	76.7	76.0	76.5	77.0	77.0	77.5	77.5	78.2	78.3	79.9	79.5	80.0	80.7	79.7	78.2	125.6
200	77.1	77.2	76.6	75.1	74.4	74.1	73.9	74.4	74.9	75.6	76.6	78.7	80.2	80.2	81.1	79.0	77.1	124.5
250	77.5	78.6	77.7	77.2	75.6	75.6	75.8	76.3	77.3	78.3	79.6	81.6	81.0	81.1	81.0	79.0	78.7	126.1
315	79.5	80.2	80.0	78.7	76.7	76.7	76.5	77.2	78.0	78.2	79.2	80.3	80.7	80.8	80.0	78.1	78.8	126.2
400	81.4	82.3	82.4	81.4	78.8	77.1	76.4	77.1	77.6	78.9	80.3	81.4	80.9	80.8	80.3	77.7	79.8	127.2
500	82.8	83.6	83.2	82.4	80.1	78.1	77.1	78.1	79.1	79.4	81.1	81.9	82.1	81.8	80.3	77.5	80.7	128.1
630	84.2	85.2	85.0	83.7	81.2	78.8	77.5	78.2	79.2	80.3	81.2	81.8	82.7	82.3	80.0	77.4	81.4	128.8
800	88.0	88.2	88.0	86.8	84.5	82.4	81.4	81.5	82.2	82.9	84.4	85.1	86.2	85.5	82.5	79.8	84.6	132.0
1000	91.0	91.9	91.8	90.0	87.5	84.7	83.8	84.4	85.2	85.9	87.9	89.1	90.0	88.5	85.0	82.4	88.0	135.4
1250	93.2	94.6	94.2	93.7	91.7	87.9	85.2	86.4	86.6	87.6	89.9	91.0	90.9	89.7	87.2	84.0	90.3	137.7
1600	93.1	94.7	94.4	94.1	92.6	88.7	86.1	87.1	87.4	88.4	90.9	91.2	92.1	90.9	87.2	84.0	90.9	138.3
2000	94.0	94.8	94.9	94.9	92.1	87.9	86.4	87.8	88.6	89.6	91.6	92.7	93.6	91.8	87.4	83.5	91.7	139.1
2500	95.2	96.7	96.2	96.2	94.5	90.0	87.7	89.0	90.2	91.5	92.8	94.5	95.2	93.5	89.2	85.0	93.4	140.8
3150	95.6	96.3	96.6	96.8	94.3	89.7	87.0	88.0	90.1	91.5	92.6	94.8	95.0	94.5	89.8	85.4	93.7	141.1
4000	93.8	96.1	96.0	97.0	94.3	89.6	85.9	86.9	89.5	89.6	91.5	93.8	94.3	92.9	87.8	84.7	93.2	140.6
5000	92.2	95.2	95.6	96.8	93.7	89.1	85.1	85.9	88.9	89.2	91.6	93.1	93.9	91.9	87.1	83.5	93.0	140.4
6300	91.6	94.4	94.3	96.3	92.6	87.7	83.0	83.8	86.5	86.6	88.8	90.5	91.8	89.9	84.9	81.3	91.9	135.3
8000	90.5	93.2	93.0	95.7	91.8	86.8	81.8	82.5	85.3	85.8	87.5	89.2	90.8	89.2	84.2	79.7	91.6	139.0
10000	88.6	91.8	91.4	94.2	90.3	84.8	79.1	79.8	82.6	82.9	84.6	86.1	87.6	86.1	81.8	77.3	90.5	137.9
12500	87.3	90.0	89.3	92.1	88.3	82.6	76.3	76.9	80.1	80.3	81.4	83.8	84.6	83.6	79.6	75.2	89.7	137.1
16000	85.8	88.1	87.2	89.7	86.1	80.1	73.6	74.3	77.3	78.0	79.1	81.2	82.1	80.9	77.3	72.6	89.3	136.7
20000	83.5	85.7	84.7	86.8	82.8	77.3	70.9	71.8	74.6	74.6	75.8	78.0	78.9	77.2	74.1	69.8	89.1	136.5
OVERALL	104.0	105.7	105.5	106.3	103.5	99.2	96.3	97.3	98.9	99.7	101.4	103.0	103.7	102.4	98.7	96.0	103.2	150.6
SIDELINE PERCEIVED NOISE LEVELS																		
DISTANCE																		
61 METERS	90.2	100.3	104.7	107.7	107.1	104.3	102.5	103.9	105.8	106.7	107.7	108.7	107.9	105.2	98.6	90.8		
113 METERS	80.9	92.5	97.4	100.7	100.3	97.7	96.1	97.7	99.4	100.3	101.3	102.1	101.2	98.3	91.4	83.0		

(b) Percent of design speed, 70; fan physical speed, 2465 rpm; fundamental blade passage frequency, 1643 hertz

FREQUENCY	ANGLE, DEG														AVERAGE SPL	POWER LEVEL (PWL)		
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140			150	160
50	76.1	73.1	74.9	74.9	74.9	74.9	75.9	76.4	76.9	77.9	78.4	84.4	83.2	83.1	83.3	85.1	79.9	127.3
63	73.2	75.5	74.2	74.2	73.7	74.5	74.5	74.5	75.5	78.5	78.3	83.8	83.5	84.5	85.0	86.4	80.2	127.6
80	78.0	75.1	74.3	74.5	74.6	75.3	75.3	76.1	77.0	80.5	80.8	85.5	85.7	87.1	88.8	90.1	82.7	130.1
100	76.3	75.3	75.1	75.1	75.8	76.9	77.8	78.6	80.9	83.4	84.1	87.4	87.4	88.1	89.6	90.2	84.2	131.6
125	80.9	80.4	81.0	79.7	80.2	80.4	81.2	81.7	83.0	84.8	84.9	89.0	87.5	88.4	88.9	87.8	85.0	132.6
160	80.3	79.8	80.8	80.3	81.1	81.1	81.6	82.1	82.5	84.5	83.8	89.0	86.5	87.0	86.1	85.1	84.3	131.7
200	80.2	80.9	79.9	79.2	79.0	78.9	78.5	78.5	79.9	81.8	81.9	86.9	86.8	86.5	87.0	84.6	83.0	130.4
250	81.2	81.7	81.0	80.5	79.8	79.8	79.8	81.0	81.8	84.5	84.3	87.2	87.0	87.2	86.5	84.7	83.5	131.3
315	81.5	82.0	81.9	81.0	80.7	80.9	80.5	81.2	81.7	83.3	83.9	87.3	86.5	86.2	85.5	82.5	83.6	131.0
400	83.4	83.7	83.9	82.2	81.1	80.7	80.2	80.9	82.1	84.1	84.2	86.2	87.1	86.6	84.9	82.2	83.9	131.3
500	84.6	85.1	85.4	84.3	82.6	81.9	81.1	81.4	81.8	84.2	84.3	85.7	86.7	86.3	84.1	81.2	84.1	131.5
630	85.9	86.4	86.2	85.2	83.4	82.7	81.1	81.7	82.9	84.8	84.9	85.8	86.6	85.7	83.6	80.8	84.5	131.9
800	89.3	89.6	89.5	88.3	87.1	85.1	84.5	83.8	84.6	86.6	87.1	88.6	89.4	88.0	85.0	82.5	87.1	134.5
1000	91.9	92.6	92.9	91.4	89.9	87.9	87.4	87.8	87.9	90.6	90.4	91.8	92.4	90.2	86.9	84.4	90.3	137.7
1250	93.2	93.9	94.6	93.4	91.8	88.6	87.9	88.6	88.9	91.0	91.4	92.7	93.2	90.7	87.7	85.0	91.4	138.8
1600	97.1	99.4	100.6	100.8	102.3	98.3	94.6	93.3	94.8	95.9	95.6	95.5	97.9	94.6	91.8	89.2	97.6	145.0
2000	95.0	96.0	96.8	96.0	94.8	91.0	90.3	91.0	91.9	94.2	94.2	95.3	96.8	93.0	89.4	86.6	94.2	141.6
2500	96.6	98.4	97.9	97.8	96.3	92.9	91.1	92.3	93.6	95.3	96.1	97.0	98.0	94.3	90.9	87.4	95.8	143.2
3150	97.7	98.9	99.7	101.2	99.4	95.0	93.0	93.9	96.9	97.1	97.9	98.7	99.4	96.7	92.2	89.0	98.1	145.5
4000	96.5	98.0	98.8	99.3	97.1	93.3	90.0	91.0	93.5	95.2	95.5	97.1	98.0	94.6	90.0	87.2	96.4	143.8
5000	95.6	98.1	99.3	100.3	98.0	93.6	90.5	91.1	93.8	95.1	95.5	97.0	97.4	94.0	89.8	87.1	96.5	144.3
6300	94.5	97.0	97.7	99.5	97.0	92.4	88.1	88.6	91.1	92.8	93.0	94.8	95.8	92.5	87.9	84.8	95.8	143.2
8000	93.4	95.9	97.1	99.6	96.4	91.2	87.2	87.7	90.2	92.6	92.4	94.1	95.3	92.4	87.6	84.1	95.5	143.3
10000	91.8	94.7	95.5	98.0	94.8	89.3	84.8	84.7	87.3	90.2	89.2	91.2	92.0	89.7	85.3	81.4	94.8	142.2
12500	90.6	92.9	93.6	95.9	93.1	87.1	82.4	81.6	84.6	87.7	86.4	89.5	89.7	87.1	83.4	78.6	94.1	141.5
16000	89.1	91.1	91.8	93.9	91.1	84.6	80.4	79.3	81.9	86.1	83.9	86.7	88.1	85.2	81.6	76.2	94.0	141.4
20000	87.0	89.1	89.3	90.9	88.4	82.0	78.1	76.7	78.9	83.8	81.2	83.5	86.3	81.7	79.1	73.5	94.1	141.5
OVERALL	106.2	108.0	108.7	109.6	108.1	104.0	101.4	101.7	103.6	105.2	105.4	106.8	107.7	105.0	102.1	100.1	107.2	154.5
DISTANCE																		
SIDELINE PERCEIVED NOISE LEVELS																		
1 METERS	92.3	102.6	107.7	111.3	111.5	109.0	107.7	108.9	111.3	112.2	112.2	112.7	112.2	107.8	101.6	94.6		

SIDELINE PERCEIVED NOISE LEVELS

DISTANCE

61 METERS	92.3	102.6	107.7	111.3	111.5	109.0	107.7	108.9	111.3	112.2	112.7	112.2	107.8	101.6	94.6
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TABLE V. - Concluded. NOISE OF FAN A CONFIGURATION 202 (HARD INLET, TAPED FAN FRAME, HARD EXHAUST, SMALL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.0002 N/sq m; PWL re 0.1 picowatt.]

(c) Percent of design speed, 80; fan physical speed, 2818 rpm; fundamental blade passage frequency, 1878 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
50	84.5	80.2	81.2	81.7	83.2	81.5	80.7	81.5	81.8	83.0	83.2	86.4	86.3	87.8	89.8	91.6	84.8	
63	77.3	79.8	78.1	78.6	78.5	78.8	78.6	80.1	80.0	82.0	82.5	86.2	86.5	89.5	91.0	93.0	84.8	
80	77.8	79.8	77.7	77.8	78.3	78.7	78.3	80.3	82.2	84.5	85.8	88.4	89.8	92.2	94.3	96.0	87.5	
100	81.3	83.8	85.3	83.6	81.9	82.3	82.4	85.4	85.9	87.9	89.1	91.0	91.9	94.8	95.9	96.0	89.7	
125	82.8	82.8	85.0	83.1	85.1	86.6	86.3	87.3	88.5	89.2	91.1	91.7	91.8	94.1	95.8	93.8	90.1	
160	84.2	85.2	86.5	84.9	86.4	87.9	87.2	87.9	87.5	89.3	89.7	91.5	90.2	92.7	92.7	90.5	89.2	
200	85.0	85.6	85.5	85.0	84.5	84.1	84.0	84.8	85.3	86.5	87.6	90.7	90.6	92.6	92.8	90.7	88.1	
250	84.8	85.6	85.0	83.5	83.8	84.3	84.6	86.0	87.3	89.2	89.5	91.2	90.8	92.6	92.8	90.7	88.7	
315	84.6	85.0	85.0	84.5	84.6	85.1	85.5	86.6	87.3	88.2	88.1	90.2	90.5	91.8	91.3	88.5	88.1	
400	86.1	86.8	85.6	85.0	84.6	85.1	84.8	85.8	86.6	88.2	89.0	90.7	90.3	91.8	90.8	87.5	88.2	
500	86.7	86.5	87.2	86.5	85.8	85.5	85.0	86.0	86.8	87.7	88.2	90.1	89.8	90.8	89.7	86.7	87.9	
630	87.5	87.5	88.0	89.0	87.7	86.9	85.2	85.9	86.4	87.5	88.2	89.6	89.9	90.2	88.4	85.2	88.0	
800	89.8	90.3	89.6	89.6	89.3	87.9	86.8	86.8	87.6	88.8	89.9	91.2	91.3	90.8	88.8	85.8	89.2	
1000	92.0	92.8	92.6	92.1	91.7	89.3	88.2	88.5	89.2	90.9	91.7	93.3	93.0	91.8	89.5	86.6	91.2	
1250	93.0	94.0	94.7	94.2	92.7	90.2	89.4	89.5	90.5	91.7	92.5	93.8	93.0	91.4	89.4	86.5	92.2	
1600	96.2	98.2	98.1	99.3	98.8	96.8	93.3	92.2	93.1	94.1	95.2	95.8	96.1	93.2	90.4	88.1	95.9	
2000	102.7	105.5	105.0	108.0	108.5	106.4	102.2	98.5	99.7	99.3	100.2	101.2	101.9	99.9	95.9	93.6	103.7	
2500	96.8	98.3	97.7	97.6	96.1	94.3	92.8	94.7	95.5	97.2	98.2	99.1	98.0	95.7	92.0	89.4	96.5	
3150	99.4	101.4	100.5	100.7	98.9	96.4	94.5	95.5	98.0	98.6	100.2	101.7	100.5	98.0	93.5	91.1	99.4	
4000	99.5	102.0	101.4	102.9	102.0	99.2	96.0	95.9	99.0	99.5	100.5	102.5	102.7	100.7	95.2	92.2	101.1	
5000	97.6	100.4	100.1	101.4	98.9	95.9	93.7	94.7	96.9	98.1	99.4	100.4	100.1	97.1	92.4	89.5	99.3	
6300	96.9	99.8	99.4	101.4	98.8	95.8	92.8	93.4	95.8	97.1	98.6	99.1	99.8	97.1	92.3	89.2	99.2	
8000	95.8	98.5	99.0	101.5	97.8	95.5	92.8	93.6	96.5	97.5	99.1	99.2	99.6	97.8	92.6	89.1	99.8	
10000	93.2	96.9	97.2	99.9	96.2	92.9	89.4	90.2	93.0	94.3	94.9	95.9	96.4	94.0	89.5	86.1	98.0	
12500	91.5	94.9	94.7	97.5	94.4	90.3	86.7	87.3	90.5	91.9	92.5	93.9	94.7	91.9	88.0	83.5	97.2	
16000	89.5	92.7	92.4	94.9	91.7	87.5	84.0	84.9	87.7	89.8	89.7	91.8	92.7	89.7	86.7	81.6	96.7	
20000	87.0	90.0	89.6	91.3	88.6	84.6	80.8	81.6	84.4	87.4	86.8	88.4	90.1	86.1	84.4	78.5	96.4	
OVERALL	108.6	111.0	110.7	112.5	111.6	109.3	106.1	105.4	107.3	108.2	109.3	110.5	110.5	109.0	106.5	104.5	110.5	
SIDELINE PERCEIVED NOISE LEVELS																		
11 METERS	95.6	106.2	110.0	114.6	115.9	115.1	112.8	111.9	114.3	114.9	115.5	116.2	114.9	111.5	105.0	98.4	108.4	

(d) Percent of design speed, 90; fan physical speed, 3170 rpm; fundamental blade passage frequency, 2113 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	84.4	80.9	84.0	83.4	85.2	84.0	83.9	86.9	85.0	86.4	86.2	89.8	89.4	91.7	94.4	95.8	88.4	135.8
63	81.9	83.4	82.8	81.8	81.9	82.6	82.8	84.1	84.3	84.9	86.9	89.7	91.3	93.6	95.6	98.5	89.3	136.7
80	82.8	84.3	81.3	82.0	81.5	82.3	82.6	85.0	86.0	87.8	90.0	92.2	93.6	97.0	99.6	101.5	92.1	135.5
100	85.7	87.2	87.6	89.4	86.6	86.7	89.9	89.7	90.6	92.9	93.7	95.3	96.5	99.4	101.5	101.1	94.6	142.0
125	87.0	86.5	87.7	87.2	88.0	89.4	89.4	91.0	91.9	93.2	94.4	95.8	96.5	98.2	100.2	98.2	94.1	141.5
160	88.3	88.6	89.8	89.0	90.5	91.3	90.8	91.6	91.8	92.3	92.5	94.7	95.0	96.5	97.5	95.2	93.0	140.4
200	88.3	88.6	87.8	87.9	88.6	88.1	87.3	88.6	89.1	90.6	91.8	94.2	95.3	96.9	97.8	94.5	92.2	135.6
250	87.5	88.1	87.6	87.3	87.3	87.8	88.5	90.1	91.5	92.6	93.3	95.1	96.1	98.0	97.3	94.7	93.0	140.4
315	86.4	87.4	87.8	88.1	88.1	88.9	89.3	89.9	91.6	92.1	92.8	95.0	95.3	96.8	96.1	93.7	92.5	139.9
400	87.6	87.7	88.2	88.1	87.6	88.9	89.1	89.7	90.7	92.1	93.1	94.5	95.6	96.4	95.2	92.1	92.3	135.7
500	87.9	88.1	88.9	88.3	88.6	88.9	88.6	89.6	90.6	91.3	92.1	94.0	94.8	95.1	94.1	91.0	91.7	139.1
630	87.8	89.1	88.8	88.3	88.0	88.3	88.5	89.1	90.1	91.0	91.8	93.4	94.1	94.1	92.8	89.5	91.1	138.5
800	91.1	91.6	91.4	92.2	91.7	90.7	89.9	91.1	91.2	91.9	92.9	94.2	94.7	94.4	92.9	90.0	92.4	135.8
1000	92.8	93.0	93.1	93.1	94.1	92.3	91.5	91.5	92.6	93.3	94.0	95.1	95.5	95.0	93.1	89.5	93.5	140.9
1250	94.0	94.7	94.9	95.4	94.7	93.0	91.9	91.9	92.5	93.0	94.2	95.0	94.9	94.2	92.7	89.9	93.9	141.3
1600	94.7	95.7	95.9	95.0	94.7	93.0	92.2	92.2	92.8	94.0	95.2	95.5	95.8	93.7	91.7	89.2	94.3	141.7
2000	104.3	105.8	106.0	107.3	106.3	104.3	100.2	98.2	99.7	99.3	100.7	102.1	100.2	99.8	96.8	93.7	102.5	150.3
2500	97.5	98.9	99.0	99.0	97.7	96.3	93.5	94.0	95.4	96.2	97.4	98.5	97.7	95.9	92.5	90.0	97.1	144.5
3150	98.8	99.6	99.3	99.1	97.1	95.1	94.0	95.1	97.5	98.1	100.5	100.9	101.3	96.6	93.6	90.8	98.8	146.2
4000	99.6	100.9	101.4	102.3	100.6	99.6	95.9	96.9	100.1	101.9	104.4	104.2	105.1	100.6	96.4	94.7	102.3	145.7
5000	97.5	99.7	99.2	99.7	97.4	95.5	93.7	95.0	97.2	98.5	99.8	100.3	101.3	98.4	94.5	91.3	99.3	146.7
6300	97.2	99.1	99.2	100.9	98.1	96.4	94.6	95.8	97.9	99.1	100.1	100.4	100.4	97.4	93.6	91.1	100.0	147.4
8000	95.8	97.7	98.3	100.2	97.2	95.3	94.8	96.5	98.4	100.1	100.9	101.1	101.6	98.6	94.4	91.2	101.0	148.4
10000	93.6	96.5	96.5	99.0	95.5	92.8	92.6	93.5	97.1	98.0	98.8	99.2	99.6	97.6	93.3	89.3	100.1	147.5
12500	91.8	94.1	94.0	96.1	93.5	90.5	89.6	90.4	93.6	94.6	95.4	95.9	96.6	94.4	90.6	86.2	98.4	145.8
16000	88.8	91.6	91.6	93.6	91.0	88.0	87.5	87.5	90.8	92.1	93.0	93.9	93.6	91.3	87.6	83.7	97.8	145.2
20000	86.3	88.8	88.6	90.4	88.3	84.9	84.8	84.6	87.4	89.1	89.8	90.9	90.6	88.8	84.8	81.3	97.5	144.9
OVERALL	109.2	110.7	110.8	111.8	110.3	108.6	106.5	106.9	108.8	109.8	111.2	111.9	112.3	111.0	110.1	108.8	111.4	158.8
SIDELINE PERCEIVED NOISE LEVELS																		
DISTANCE																		
61 METERS	96.7	106.3	110.7	114.2	114.8	114.5	112.7	113.3	115.7	116.9	118.2	117.8	117.1	112.7	107.3	100.5		
205 METERS	69.4	83.9	90.3	94.8	96.3	96.5	94.9	95.1	96.7	97.5	98.6	98.0	96.6	92.8	87.5	79.5		

SIDELINE PERCEIVED NOISE LEVELS

DISTANCE

61 METERS	96.7	106.3	110.7	114.2	114.8	114.5	112.7	113.3	115.7	116.9	118.2	117.8	117.1	112.7	107.3	100.5
305 METERS	69.4	83.9	90.3	94.8	96.3	96.5	94.9	95.1	96.7	97.5	98.6	98.0	96.6	92.8	87.5	79.5

TABLE VI. - NOISE OF FAN A CONFIGURATION 203 (HARD INLET, TAPED FAN FRAME, HARD EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(a) Percent of design speed, 60; fan physical speed, 2115 rpm; fundamental blade passage frequency, 1410 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	71.7	69.5	70.2	70.5	70.8	71.7	71.5	72.3	72.0	73.5	73.5	76.6	77.5	77.0	80.0	79.5	74.6	122.0
63	70.8	70.8	69.8	69.5	70.0	70.5	70.3	71.0	71.7	73.5	73.8	76.2	78.0	78.7	80.2	80.7	74.8	122.2
80	70.8	71.0	68.7	69.2	69.8	70.5	69.8	71.8	73.0	74.5	76.2	78.6	80.0	81.5	83.3	83.2	76.5	124.3
100	73.3	75.3	72.1	72.1	72.3	72.5	73.5	74.8	77.0	78.0	78.8	80.7	82.0	82.6	85.1	84.5	79.0	126.4
125	75.6	76.6	76.1	75.3	76.1	76.3	77.1	76.9	78.4	79.2	80.4	81.4	81.8	81.9	84.4	83.1	79.6	127.0
160	75.3	77.0	76.6	75.6	75.6	76.8	77.3	77.3	77.8	78.5	79.0	79.7	80.5	80.6	81.8	79.7	78.5	125.9
200	76.1	76.6	74.8	74.6	73.6	73.8	74.1	74.0	75.0	76.0	76.5	78.9	80.3	80.1	82.0	79.3	77.1	124.5
250	76.1	77.3	76.0	75.5	75.3	74.6	74.6	76.0	76.8	78.0	78.6	80.6	81.1	81.1	82.3	79.4	78.3	125.7
315	77.0	78.0	77.7	76.8	76.2	75.3	76.0	76.3	77.2	77.2	78.2	79.8	80.7	80.7	80.8	77.7	78.1	125.5
400	78.7	79.6	78.7	77.9	76.7	75.4	75.4	75.4	76.7	77.6	78.9	80.2	80.7	80.6	80.6	77.7	78.4	125.8
500	80.5	80.8	79.8	79.1	77.8	76.5	75.5	76.8	77.0	78.2	79.0	80.2	81.0	80.5	79.6	76.2	78.8	126.2
630	82.4	82.5	81.9	80.7	78.9	77.0	76.5	76.4	77.7	79.3	79.5	79.8	81.2	80.2	79.0	75.2	79.4	126.8
800	85.9	85.5	85.0	83.9	81.5	79.5	79.5	79.0	80.0	81.0	81.5	82.3	83.9	82.7	80.5	76.5	82.0	129.4
1000	88.4	89.3	88.4	87.1	85.3	82.3	81.6	81.4	82.3	84.1	84.9	86.4	87.8	86.4	83.3	79.3	85.4	132.8
1250	91.2	93.1	92.7	91.4	89.7	87.1	85.2	84.7	84.9	87.0	88.9	89.0	89.6	87.4	84.6	81.0	88.7	136.1
1600	91.8	93.7	93.2	92.2	90.2	87.5	85.7	85.2	85.7	87.8	89.5	90.0	91.2	87.8	84.5	81.4	89.4	136.8
2000	91.8	92.3	92.3	92.0	89.3	86.1	84.6	85.3	86.0	87.5	89.1	91.1	92.8	90.5	86.5	82.2	89.6	137.0
2500	92.9	94.4	93.5	94.2	91.5	88.5	85.7	87.2	88.7	90.2	90.9	93.3	94.4	91.5	87.7	83.3	91.6	139.0
3150	93.6	95.3	94.9	95.1	92.6	89.1	86.1	86.9	89.4	91.2	91.1	93.9	95.1	92.8	88.6	84.4	92.6	140.0
4000	93.1	95.5	95.5	96.1	93.5	89.6	86.5	86.5	90.5	89.6	92.0	93.3	94.5	92.3	87.5	83.3	92.5	140.3
5000	91.6	93.8	92.9	94.5	92.8	87.9	84.6	85.3	87.1	88.0	89.8	92.4	93.4	91.6	87.1	82.3	91.7	139.1
6300	89.5	92.2	92.9	95.2	90.6	86.6	82.3	81.5	85.0	86.1	87.3	89.3	91.5	89.5	85.4	79.5	90.7	138.1
8000	88.4	91.5	91.9	94.4	90.2	85.9	81.0	83.7	85.1	86.4	87.9	90.2	88.5	88.5	84.5	78.6	90.4	137.8
10000	87.2	90.0	90.4	92.7	88.4	83.9	79.7	77.3	80.8	82.2	83.7	85.4	87.0	85.7	82.4	75.8	89.3	136.7
12500	85.8	88.0	88.0	90.8	87.2	81.3	79.3	75.2	77.6	79.0	80.2	82.6	84.0	82.8	80.0	72.9	88.5	135.9
16000	83.5	85.9	86.6	87.8	84.4	78.4	78.4	71.4	74.4	76.9	76.6	79.5	81.1	79.4	76.8	70.1	87.8	135.2
20000	82.3	83.7	84.2	84.1	81.9	75.8	78.4	67.8	70.6	73.8	73.5	76.1	77.5	75.6	73.3	66.8	87.8	135.2
OVERALL	102.2	104.1	103.8	104.6	101.7	98.1	95.7	95.8	97.7	98.9	100.1	101.9	103.2	101.2	98.2	94.8	101.9	149.3
DISTANCE																		
SIDELINE PERCEIVED NOISE LEVELS																		
61 METERS	88.3	98.9	102.9	106.2	105.6	103.4	101.7	102.6	105.2	106.1	106.6	107.6	107.6	103.8	97.8	89.5		
133 METERS	78.9	90.8	95.5	98.9	98.6	96.8	95.2	96.2	98.6	99.7	99.9	101.1	100.9	96.9	90.6	81.7		

DISTANCE

SIDELINE PERCEIVED NOISE LEVELS

61 METERS	88.3	98.9	102.9	106.2	105.6	103.4	101.7	102.6	105.2	106.1	106.6	107.6	107.6	103.8	97.8	89.5
113 METERS	78.9	90.8	95.5	98.9	98.6	96.8	95.2	96.2	98.6	99.7	99.9	101.1	100.9	96.9	90.6	81.7

(b) Percent of design speed, 70; fan physical speed, 2468 rpm; fundamental blade passage frequency, 1645 hertz

FREQUENCY	ANGLE, DEG																	AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160			
50	76.6	73.6	74.8	76.3	75.3	75.6	76.4	77.1	76.9	77.9	78.3	84.0	83.8	82.9	84.6	85.8	80.2	127.6	
63	73.0	75.4	74.5	73.9	74.0	74.7	74.0	75.4	75.7	76.7	78.5	83.6	84.2	83.7	86.5	86.7	80.4	127.8	
80	80.1	74.9	73.9	73.9	74.4	75.4	75.2	76.6	77.6	80.1	81.6	85.8	86.7	86.7	89.7	89.6	83.0	130.4	
100	76.2	75.7	75.4	75.7	76.1	77.2	77.6	79.2	81.2	82.7	84.1	87.3	88.4	89.4	91.2	90.1	84.8	132.2	
125	78.9	79.8	80.1	79.3	80.3	80.4	80.6	82.1	83.4	84.1	84.4	87.3	88.1	88.6	90.6	88.2	85.0	132.0	
160	78.9	80.4	80.8	80.1	81.1	81.1	81.3	82.4	82.4	83.1	83.1	87.4	86.9	86.3	87.3	85.3	83.9	131.3	
200	79.5	80.5	79.5	79.0	78.6	78.5	78.3	79.0	80.0	80.8	81.8	86.2	87.5	86.6	87.6	85.0	83.0	130.4	
250	79.4	80.9	79.9	79.3	78.4	79.3	79.3	80.4	81.8	83.3	83.8	86.9	87.6	87.1	87.6	84.8	83.7	131.1	
315	79.6	80.6	80.4	80.1	79.9	79.4	80.3	80.6	81.8	82.8	83.3	86.5	87.1	86.3	86.1	83.0	83.3	130.7	
400	80.4	81.7	81.2	80.2	80.6	79.6	79.9	80.2	81.4	82.7	83.2	86.8	87.1	86.1	85.9	82.3	83.4	130.8	
500	82.4	82.1	82.4	81.6	80.7	79.7	80.1	80.4	81.6	82.6	83.1	85.2	85.9	85.4	84.6	81.3	82.9	130.3	
630	83.3	84.1	84.0	83.1	81.8	80.3	80.5	80.5	82.1	83.0	83.8	84.6	86.1	84.8	83.8	79.9	83.2	130.6	
800	86.6	86.9	86.7	85.7	84.7	82.6	82.2	82.6	83.4	84.2	84.9	86.0	87.6	85.7	84.2	80.6	84.9	132.3	
1000	89.1	89.6	89.5	88.5	87.0	84.6	84.1	84.4	84.9	86.6	87.3	88.9	90.1	87.7	85.7	82.3	87.3	134.7	
1250	90.8	91.8	91.6	90.6	89.3	86.6	85.8	85.9	86.9	87.8	89.3	90.4	90.6	88.1	86.3	82.3	88.9	136.3	
1600	96.3	98.3	101.3	99.0	99.1	97.3	93.6	91.6	92.8	93.3	95.5	96.4	96.6	92.0	90.1	88.0	96.3	143.7	
2000	92.6	93.6	93.9	93.2	92.0	89.5	87.7	88.7	89.4	90.4	92.1	93.3	95.4	91.4	88.2	84.6	91.9	139.3	
2500	93.8	95.5	94.7	95.0	93.3	90.3	88.3	90.0	91.4	91.8	93.7	95.8	97.2	92.7	89.8	85.6	93.6	141.0	
3150	96.3	97.3	98.2	99.5	97.5	94.8	92.3	92.3	97.0	94.3	96.8	98.5	101.0	96.0	94.0	89.1	97.4	144.8	
4000	94.9	97.0	97.1	97.9	96.1	92.9	89.6	90.8	92.9	94.1	95.4	96.8	97.8	94.8	50.6	86.6	95.7	143.1	
5000	95.5	97.6	96.5	98.3	96.8	92.5	89.8	91.3	92.8	93.5	95.0	96.8	97.8	94.3	90.5	86.5	96.0	143.4	
6300	91.9	95.0	96.6	98.5	94.6	91.6	87.0	86.4	90.0	91.0	92.0	94.2	95.5	93.4	89.1	83.7	94.7	142.1	
8000	91.4	94.6	95.2	97.7	94.1	91.1	86.4	86.2	89.2	90.4	91.2	93.2	94.4	92.2	88.0	82.8	94.5	141.9	
10000	89.8	92.6	93.1	95.9	92.6	89.1	84.1	82.6	86.1	87.4	88.2	90.5	91.7	89.1	85.8	79.8	93.2	140.6	
12500	88.6	90.9	91.4	93.6	90.9	86.6	81.2	80.4	82.6	84.1	85.0	88.0	88.6	86.4	83.4	77.2	92.2	139.6	
16000	86.4	88.9	90.2	91.2	88.1	83.6	77.1	76.7	80.1	81.6	82.2	85.3	86.1	83.4	80.9	74.4	91.7	139.1	
20000	85.4	86.9	87.5	87.6	85.3	81.0	75.5	73.1	76.3	78.3	79.6	81.7	82.8	79.9	77.1	71.7	91.4	138.8	
OVERALL	104.5	106.4	107.2	107.7	105.8	103.1	100.1	100.3	102.6	102.8	104.3	106.1	107.4	104.3	102.5	99.6	105.8	153.2	
SIDELINE PERCEIVED NOISE LEVELS																			
DISTANCE																			
61 METERS	90.7	100.9	106.0	109.5	109.5	108.3	106.7	107.4	110.7	109.7	111.1	112.2	112.6	107.1	102.4	94.1			

SIDELINE PERCEIVED NOISE LEVELS

DISTANCE

61 METERS 90.7 100.9 106.0 109.5 109.5 108.3 106.7 107.4 110.7 109.7 111.1 112.2 112.6 107.1 102.4 94.1

TABLE VI. - Concluded. NOISE OF FAN A CONFIGURATION 203 (HARD INLET, TAPED FAN FRAME, HARD EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15°C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(c) Percent of design speed, 80; fan physical speed, 2818 rpm; fundamental blade passage frequency, 1878 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	82.5	84.5	85.0	85.5	85.3	80.8	81.8	81.7	83.0	82.0	83.8	85.1	87.0	87.7	90.7	91.5	85.4	132.8
63	76.9	79.4	78.3	77.6	78.8	78.6	78.3	79.4	80.3	79.9	83.9	85.2	88.1	89.4	91.3	92.3	84.8	132.2
80	78.3	79.5	77.8	78.0	78.0	78.8	77.8	80.0	81.8	83.5	85.5	87.6	91.0	92.6	95.6	95.5	87.8	135.2
100	80.3	80.3	81.9	82.4	80.8	82.6	82.6	83.9	86.1	87.4	88.9	90.7	92.6	94.3	96.6	95.6	89.6	137.0
125	83.3	82.6	83.6	83.6	85.3	86.1	85.3	86.5	88.1	88.5	90.1	92.1	92.8	93.8	96.1	93.5	90.0	137.4
160	84.3	84.7	85.3	85.0	85.8	86.5	85.5	87.2	87.2	87.5	88.8	90.4	91.3	92.0	93.3	90.5	88.7	136.1
200	84.0	84.6	84.0	84.8	83.3	83.6	83.0	83.8	84.5	85.5	87.5	89.9	91.5	92.0	93.3	90.7	87.8	135.2
250	83.6	83.8	84.0	83.5	83.1	84.0	83.8	85.0	86.3	87.5	88.1	91.2	92.3	92.8	93.6	90.5	88.6	136.0
315	82.8	83.3	83.5	84.3	84.3	84.5	84.6	85.5	86.1	87.0	88.0	90.4	91.3	92.1	92.3	88.7	88.0	135.0
400	83.3	83.6	84.5	84.8	84.6	85.0	84.0	84.8	86.1	88.0	88.0	90.2	91.5	92.0	91.3	87.3	88.0	135.4
500	84.1	84.6	84.6	84.6	84.4	84.4	83.9	84.6	86.1	86.9	87.7	89.2	90.6	90.6	90.4	86.3	87.3	134.7
630	85.2	85.2	86.5	85.9	85.4	84.9	84.2	84.5	85.7	87.0	87.5	88.4	89.9	89.5	89.5	84.7	87.0	134.4
800	87.4	87.1	86.9	86.7	86.2	85.6	85.2	84.7	86.2	87.1	88.4	89.7	90.9	90.1	88.4	84.8	87.7	135.1
1000	89.2	89.2	88.7	88.4	88.2	86.0	85.7	85.8	86.7	87.7	89.2	90.4	91.7	90.5	89.0	85.4	88.6	136.0
1250	90.7	91.2	91.1	91.1	89.9	87.9	87.1	86.7	87.7	89.2	89.9	90.5	91.4	90.1	88.2	85.0	89.6	137.0
1600	94.2	94.8	96.0	96.3	95.2	94.1	90.2	90.0	89.7	90.8	92.5	93.3	94.3	90.5	88.5	85.1	93.1	140.5
2000	101.8	102.5	105.1	105.6	104.8	104.5	99.0	98.2	97.0	98.5	98.8	98.3	100.7	96.5	93.7	91.6	101.5	148.9
2500	92.5	93.6	93.4	93.6	91.6	90.1	88.3	89.6	90.8	91.6	93.5	95.5	95.8	92.3	89.3	85.6	92.8	140.2
3150	95.4	96.9	97.1	97.4	95.4	93.3	91.6	91.7	94.6	95.4	97.9	99.0	99.9	95.6	92.6	88.4	96.7	144.1
4000	98.5	100.5	101.0	102.3	100.5	99.3	96.1	94.5	99.6	99.6	103.3	101.6	105.0	101.1	98.5	92.1	101.5	148.9
5000	95.1	96.8	96.8	97.6	96.1	92.9	91.6	93.3	94.4	95.8	97.2	99.1	101.4	95.4	93.1	88.4	97.5	144.9
6300	93.2	96.1	97.4	98.9	95.3	92.8	90.8	91.4	95.0	95.9	97.1	98.6	101.6	95.9	93.3	87.6	98.0	145.4
8000	92.8	95.4	96.6	99.2	95.9	93.3	90.9	92.1	99.3	96.4	99.1	98.5	100.4	98.3	93.8	88.8	99.3	146.7
10000	90.6	93.8	94.6	97.8	94.1	90.9	87.9	86.9	92.3	92.1	93.8	95.0	95.9	93.2	90.1	84.3	96.4	143.8
12500	89.3	91.1	92.0	95.1	92.2	88.3	85.1	85.6	88.9	89.5	90.8	92.0	93.6	90.5	87.5	81.6	95.2	142.6
16000	86.4	88.6	90.1	92.0	89.1	85.7	81.6	81.9	85.5	86.9	87.9	90.0	91.2	88.7	85.6	79.6	94.5	141.9
20000	83.9	85.8	87.6	88.0	86.3	83.0	79.2	78.1	81.6	83.8	85.0	86.9	87.6	84.4	81.6	76.5	93.5	141.3
OVERALL	106.5	107.9	109.2	110.2	108.5	107.4	103.8	103.7	106.3	106.5	108.6	108.9	111.0	108.1	107.0	104.2	109.0	156.4
SIDELINE PERCEIVED NOISE LEVELS																		
DISTANCE																		
1 METERS	93.9	103.2	108.9	112.2	112.8	113.2	110.3	110.6	113.6	113.8	115.9	114.9	116.0	111.0	106.3	97.3		

(d) Percent of design speed, 90; fan physical speed, 3167 rpm; fundamental blade passage frequency, 2111 hertz

FREQUENCY	ANGLE, DEG											AVERAGE SPL	POWER LEVEL (PWL)				
	10	20	30	40	50	60	70	80	90	100	110			120	130	140	150
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
50	86.7	83.8	82.6	83.6	86.3	85.3	84.9	86.6	84.1	86.4	87.3	88.3	90.8	92.1	95.6	95.6	136.2
63	82.0	83.3	82.8	81.5	82.7	82.7	83.5	83.8	84.0	84.5	87.0	89.1	91.8	93.8	96.7	97.7	136.8
80	83.0	83.5	81.7	81.8	82.5	83.0	82.8	84.5	86.2	88.0	90.5	91.7	94.7	97.0	100.7	101.1	135.9
100	86.4	86.9	86.9	88.3	86.6	86.1	88.3	89.3	89.6	92.4	92.9	95.2	97.3	99.6	102.1	101.2	142.1
125	87.7	87.2	86.8	87.3	87.8	89.3	89.8	91.0	91.8	93.0	94.2	95.8	98.7	101.3	98.2	94.4	141.8
160	87.7	88.7	88.7	89.0	90.2	90.5	90.8	91.0	92.0	92.5	92.8	94.2	95.5	97.3	98.8	95.7	140.7
200	87.4	88.3	88.1	87.9	87.8	87.3	87.4	87.8	89.1	89.9	91.8	93.5	95.9	97.1	98.6	94.5	139.7
250	87.0	87.5	87.3	87.5	87.3	87.8	88.3	89.5	90.5	92.0	93.5	95.1	96.3	97.7	98.7	95.6	140.5
315	86.7	87.0	88.3	89.0	88.2	88.7	88.8	89.7	91.0	91.5	92.8	94.3	96.2	97.0	97.2	93.5	140.0
400	86.1	87.1	87.6	88.6	88.1	89.4	88.4	88.9	90.4	91.4	92.7	94.5	95.9	96.7	96.4	92.1	139.8
500	88.7	89.8	89.0	89.5	90.3	88.8	88.5	89.5	90.5	91.5	92.3	93.6	95.2	95.5	95.2	90.5	135.4
630	87.2	88.3	89.3	90.8	90.0	89.1	89.5	90.0	91.0	91.5	92.5	93.2	94.6	94.3	93.3	89.4	139.1
800	92.4	91.6	91.1	95.1	92.8	89.8	90.6	92.0	91.3	92.6	93.0	93.7	95.3	94.6	93.6	90.2	140.3
1000	92.6	92.2	93.8	93.1	96.1	92.0	92.0	90.6	91.3	92.1	93.3	94.4	95.6	95.5	94.0	90.2	140.9
1250	93.2	94.7	95.1	96.2	94.5	92.7	92.6	91.9	91.7	92.7	94.4	94.2	94.7	94.6	93.4	89.8	141.3
1600	93.1	93.6	93.4	93.4	92.6	91.7	90.9	90.5	91.5	92.9	94.0	95.2	96.0	93.0	91.7	88.2	140.6
2000	103.7	104.8	105.2	106.2	103.5	101.6	99.0	96.3	99.1	97.5	102.0	101.1	100.5	96.5	94.6	92.1	101.6
2500	95.2	96.2	96.5	96.7	95.2	93.7	91.7	92.2	93.7	94.2	96.2	97.3	96.7	94.2	92.2	88.3	142.7
3150	94.1	95.7	96.4	97.2	95.2	93.9	92.7	93.4	95.6	96.4	97.9	99.9	99.4	95.2	92.9	89.5	144.3
4000	97.4	99.0	99.6	100.6	98.8	96.3	97.1	96.3	102.0	102.1	102.3	102.9	103.6	101.5	97.0	94.3	101.4
5000	94.8	96.3	96.3	97.3	96.1	93.3	93.0	93.8	95.8	96.8	97.6	99.6	101.0	98.6	95.3	90.8	145.4
6300	93.6	95.3	97.0	99.5	94.8	93.2	93.0	93.2	98.0	97.4	98.4	99.5	99.5	96.7	93.6	89.2	145.9
8000	92.9	94.7	95.5	97.3	94.5	92.9	93.0	93.9	96.7	99.3	98.8	99.8	100.1	96.5	93.6	88.5	146.6
10000	91.9	93.3	94.1	95.9	92.4	91.1	91.1	90.6	94.4	96.1	97.1	99.2	98.8	96.3	93.5	87.5	145.9
12500	90.0	90.8	91.5	93.3	90.8	88.0	88.2	88.7	91.0	92.6	93.6	95.5	95.8	93.5	90.8	84.6	144.2
16000	86.4	88.1	89.6	90.9	87.7	85.2	85.2	85.4	89.1	90.4	90.9	93.0	93.1	90.4	87.4	81.7	143.5
20000	84.0	85.4	86.4	86.5	85.0	82.4	83.8	82.0	85.0	86.8	88.0	89.6	89.9	87.5	84.7	79.3	143.0
OVERALL	107.7	108.8	109.3	110.4	108.3	106.6	105.9	105.6	108.3	108.9	110.1	111.1	111.7	110.7	110.8	108.6	157.7

SIDELINE PERCEIVED NOISE LEVELS

61 METERS	95.7	104.9	109.5	113.1	112.9	112.4	112.2	112.4	116.1	116.4	116.8	116.8	116.2	112.8	107.8	100.4
305 METERS	68.6	82.9	89.3	93.9	94.5	94.5	94.2	93.7	96.9	97.1	97.8	97.1	96.0	91.9	87.3	79.1

TABLE VII. - NOISE OF FAN A CONFIGURATION 204 (HARD INLET, PARTIALLY TAPED FRAME, HARD EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15°C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(a) Percent of design speed, 60; fan physical speed, 2124 rpm; fundamental blade passage frequency, 1416 hertz

FREQUENCY	ANGLE, DEG											AVERAGE SPL	POWER LEVEL (PWL)				
	10	20	30	40	50	60	70	80	90	100	110			120	130	140	150
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
50	71.9	70.4	71.0	68.9	70.9	72.0	73.4	74.9	73.9	73.9	74.5	77.1	77.0	77.0	79.5	80.4	122.5
63	70.7	71.3	70.3	68.3	70.8	71.3	73.0	73.5	72.0	73.0	74.8	77.3	77.8	77.8	80.0	80.7	122.5
80	72.2	70.7	68.9	67.9	70.5	70.7	72.0	73.2	72.9	75.0	76.0	79.0	80.2	80.5	83.2	82.9	124.3
100	74.5	74.0	73.0	70.4	73.0	73.4	74.5	75.7	76.4	77.9	79.0	80.3	81.4	82.5	84.5	84.2	126.2
125	76.7	75.3	75.7	73.0	75.8	76.3	76.3	77.5	78.3	78.5	80.0	81.3	81.8	82.0	84.2	83.1	126.8
160	76.5	75.8	76.2	73.7	75.7	77.0	77.0	77.2	78.2	78.3	78.5	79.4	79.8	80.0	81.2	80.2	125.6
200	77.2	76.5	75.5	72.5	74.2	74.3	74.2	74.3	74.8	75.5	76.2	78.8	79.7	80.2	81.3	79.1	124.3
250	78.2	77.5	76.3	73.7	75.0	75.2	75.2	75.8	77.0	78.2	78.8	80.3	80.7	80.7	81.5	78.7	125.5
315	78.9	78.3	77.9	74.9	76.8	75.9	76.1	76.8	77.1	77.8	78.4	80.0	79.9	80.6	80.1	78.1	125.5
400	79.9	80.6	80.3	78.3	79.8	76.4	75.8	75.9	77.1	78.6	78.9	80.4	80.8	80.4	79.8	77.0	126.3
500	81.0	82.1	80.0	77.6	78.4	76.8	76.4	76.9	77.4	78.3	78.8	80.2	81.3	80.8	79.6	76.5	126.4
630	82.1	81.7	81.1	77.9	78.1	76.9	75.9	76.6	77.7	78.6	78.9	80.0	81.2	80.4	79.1	76.0	126.4
800	84.9	84.6	83.7	80.2	80.2	78.1	77.7	77.7	78.9	80.2	80.7	81.8	83.4	82.2	80.1	77.1	128.3
1000	87.3	87.3	86.4	82.8	82.4	80.3	79.0	79.0	80.4	81.5	82.1	83.9	85.3	84.0	81.2	77.5	130.3
1250	91.5	92.0	91.9	87.7	87.0	84.5	81.2	81.5	82.2	83.5	85.2	87.1	87.7	85.4	83.0	80.2	133.9
1600	92.3	93.0	92.5	88.8	88.0	85.3	81.5	81.6	82.6	83.4	85.4	87.7	88.6	86.8	83.6	80.5	134.6
2000	90.7	91.2	90.9	87.4	86.9	83.4	80.4	80.1	81.4	82.2	83.6	86.0	87.9	85.9	82.6	78.2	132.3
2500	93.2	93.2	93.0	90.5	89.3	85.8	82.3	82.2	83.3	85.5	86.8	88.3	91.2	89.2	85.2	80.4	136.0
3150	93.6	93.6	94.6	91.8	90.3	86.4	83.1	82.9	84.9	87.1	88.3	90.1	92.4	91.3	86.9	82.2	137.5
4000	92.7	93.9	94.7	92.6	91.1	86.4	82.7	82.6	84.6	86.3	88.3	90.9	92.6	90.2	85.9	82.1	137.8
5000	91.1	92.2	92.4	91.2	89.7	86.7	81.6	81.4	84.1	86.2	87.2	90.4	92.4	90.7	85.9	81.7	137.2
6300	90.4	91.0	92.8	92.0	89.9	84.9	79.9	80.2	82.5	84.5	86.2	85.9	88.5	87.2	82.2	78.0	136.2
8000	88.4	88.9	90.9	90.4	88.3	83.9	77.7	77.6	80.1	82.6	83.7	85.3	87.3	85.6	82.3	76.1	135.2
10000	86.4	87.2	89.2	89.4	86.9	81.9	75.7	75.6	78.7	80.9	81.6	83.0	85.1	83.1	80.3	73.1	134.5
12500	85.5	84.2	87.3	87.5	85.3	80.5	73.6	74.0	77.0	79.6	79.8	82.4	84.1	81.5	80.5	71.5	134.3
16000	83.5	80.9	85.3	84.6	82.8	77.6	70.9	70.4	74.1	76.8	77.1	78.7	80.9	79.8	77.3	69.8	133.5
20000	81.6	77.1	82.5	81.8	79.3	74.6	67.3	67.8	70.8	74.3	73.8	75.3	78.0	75.4	73.6	67.5	133.1
OVERALL	102.1	102.5	103.1	101.1	99.7	96.1	92.7	92.8	94.3	96.0	97.2	99.2	100.9	99.4	96.8	94.0	147.1
SIDELINE PERCEIVED NOISE LEVELS																	
61 METERS	88.4	97.5	102.4	102.8	103.5	101.2	99.0	99.4	101.3	102.9	103.6	104.9	105.3	102.2	96.2	88.0	
113 METERS	79.1	89.4	95.0	95.6	96.6	94.6	92.5	93.0	94.9	96.5	97.2	98.1	98.6	95.3	89.0	80.2	

(b) Percent of design speed, 70; fan physical speed, 2473 rpm; fundamental blade passage frequency, 1648 hertz

FREQUENCY	ANGLE, DEG															AVERAGE SPL	POWER LEVEL (PWL)
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150		
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
50	76.2	74.5	75.4	73.4	75.7	76.7	77.0	77.2	77.7	77.4	79.2	80.3	81.2	82.2	84.5	85.5	79.4
63	73.3	75.5	73.7	72.3	75.0	75.0	75.0	75.7	75.5	76.7	78.5	80.1	83.7	84.2	85.5	87.4	79.5
80	78.3	76.0	73.5	72.8	74.6	75.5	76.1	76.3	77.1	78.6	81.3	82.7	85.3	87.1	89.3	89.4	82.3
100	77.0	76.5	76.0	73.9	75.7	77.9	78.9	79.4	80.7	83.2	84.0	85.8	88.0	88.9	90.7	90.8	84.5
125	79.5	79.4	79.4	76.9	79.2	80.5	80.7	82.0	83.5	84.0	85.2	85.8	87.4	88.9	90.2	89.4	84.8
160	79.2	80.9	80.5	77.7	80.2	81.5	81.7	82.2	83.0	83.4	83.5	84.8	85.5	86.7	88.0	86.2	83.6
200	80.2	80.4	79.0	77.0	78.5	79.2	78.9	78.9	79.9	80.9	82.0	83.3	85.5	86.7	87.2	85.2	82.3
250	80.4	81.4	79.9	76.5	78.2	78.5	79.7	80.5	81.5	83.2	84.0	85.3	86.4	87.0	87.0	85.1	83.2
315	79.9	81.2	80.6	77.6	79.6	80.4	80.7	81.1	81.9	82.6	83.4	84.5	86.1	86.2	86.1	83.6	82.9
400	81.8	82.3	81.8	78.3	79.6	80.3	80.5	80.6	81.5	82.5	83.3	85.0	86.1	86.0	85.8	82.7	83.0
500	82.5	82.6	82.3	79.0	80.0	80.3	80.6	80.8	81.8	82.6	83.1	84.4	85.6	85.6	84.6	81.7	82.8
630	83.9	84.2	83.7	80.2	80.7	80.4	80.4	81.2	82.1	82.9	83.7	84.7	85.7	85.4	84.2	80.8	83.1
800	86.9	86.4	85.8	82.3	83.1	81.8	81.8	81.9	82.8	83.6	84.6	86.0	87.3	86.3	84.6	81.7	84.4
1000	88.3	88.5	87.9	84.0	84.8	82.5	82.5	83.0	83.5	84.8	85.5	86.7	88.1	86.3	84.6	81.5	85.4
1250	90.1	91.5	90.0	85.8	86.5	84.0	82.8	83.3	84.1	84.8	86.1	87.7	88.8	87.1	84.5	81.5	86.6
1600	96.6	99.3	99.9	95.1	96.4	93.3	90.3	88.3	89.4	89.6	91.6	93.9	93.4	91.6	88.1	85.5	93.8
2000	92.4	93.4	93.2	89.2	89.0	86.4	84.0	84.2	84.9	85.9	87.9	89.5	91.7	88.9	85.0	81.5	88.8
2500	93.8	94.3	94.1	91.1	90.8	87.6	85.1	85.4	86.8	87.8	89.4	91.1	93.4	90.9	86.4	82.9	90.4
3150	96.8	96.8	98.4	95.6	95.3	91.9	88.4	88.3	93.8	92.3	95.1	96.4	98.1	94.3	90.3	86.5	95.1
4000	94.4	95.6	96.5	94.2	93.7	89.1	85.9	87.1	88.7	90.7	92.4	94.7	96.1	93.2	88.7	84.7	93.3
5000	94.7	97.2	96.9	95.2	94.2	92.1	87.6	87.5	90.7	91.5	93.7	96.5	97.4	95.0	90.0	86.7	94.9
6300	93.4	94.2	96.1	94.9	94.6	89.4	85.2	85.7	87.0	89.4	91.4	90.7	92.3	91.3	85.4	81.5	92.8
8000	91.4	92.4	94.3	93.3	92.7	88.3	83.1	83.4	85.4	87.6	89.1	90.3	91.8	89.6	85.6	80.3	91.5
10000	89.6	90.6	93.1	92.4	91.3	86.6	81.1	80.9	83.2	85.4	86.6	87.8	89.1	87.1	83.6	77.7	91.1
12500	88.9	87.6	91.2	90.9	89.2	85.2	79.1	79.2	81.4	83.7	84.7	86.7	88.4	85.2	83.4	75.7	90.9
16000	86.7	84.5	89.2	87.9	87.1	82.6	76.9	76.1	79.2	81.1	82.1	83.3	85.4	83.4	80.2	74.5	90.2
20000	84.7	80.8	86.7	85.0	83.3	79.3	73.3	73.5	76.5	77.8	79.1	80.3	81.6	80.0	76.8	72.2	89.8
OVERALL	104.6	105.7	106.6	104.1	103.8	100.5	97.6	97.5	99.8	100.5	102.3	103.9	105.3	103.3	101.2	99.2	103.8
SIDELINE PERCEIVED NOISE LEVELS																	
61 METERS	90.9	100.5	105.7	105.7	107.5	105.9	103.9	104.4	107.9	107.6	109.3	109.9	110.2	105.9	100.0	92.6	

TABLE VII. - Concluded. NOISE OF FAN A CONFIGURATION 204 (HARD INLET, PARTIALLY TAPED FRAME, HARD EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(c) Percent of design speed, 80; fan physical speed, 2829 rpm; fundamental blade passage frequency, 1886 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
50	85.3	85.4	86.9	84.6	86.6	81.3	81.9	80.9	82.4	82.7	83.9	85.5	86.6	88.1	89.6	91.1	85.4	
63	77.0	79.5	79.2	76.5	79.3	78.8	79.7	79.8	80.0	81.5	82.7	86.4	87.5	89.2	91.2	92.2	84.8	
80	78.3	79.7	77.2	75.8	78.8	78.5	78.3	80.0	81.5	83.2	85.2	89.1	90.2	91.7	94.2	94.6	87.1	
100	81.8	80.9	83.7	80.4	81.8	82.4	82.8	84.4	85.8	87.9	88.9	91.5	93.1	94.6	96.3	95.8	89.8	
125	84.0	82.7	83.2	82.0	84.0	86.0	85.3	86.5	87.6	89.2	89.6	91.7	92.5	93.5	95.8	92.5	89.7	
160	84.0	84.2	85.2	83.6	85.6	86.5	86.1	87.0	87.3	88.5	88.8	90.4	91.0	92.0	92.6	90.4	88.6	
200	84.6	84.7	84.5	82.0	83.8	83.8	83.3	83.6	85.0	86.0	87.3	89.7	91.1	92.0	93.1	90.2	87.7	
250	84.0	84.2	84.2	81.2	82.7	84.0	83.8	85.3	86.7	88.0	89.0	90.9	91.8	93.2	92.8	90.0	88.5	
315	83.2	84.3	84.0	82.2	84.2	84.9	84.5	85.5	86.4	87.5	88.5	90.1	91.7	92.0	91.5	88.4	88.0	
400	84.1	84.2	83.9	82.9	84.8	85.1	83.9	84.9	85.6	87.7	88.4	90.0	91.3	91.4	90.9	87.6	87.8	
500	84.6	83.9	84.4	82.4	84.4	83.9	84.1	85.3	85.9	87.4	87.9	89.2	90.3	90.6	89.8	85.8	87.2	
630	85.5	85.2	85.7	86.1	85.8	84.3	84.1	85.1	85.6	87.2	87.8	89.4	90.5	90.3	88.6	85.0	87.3	
800	87.5	87.0	86.7	85.0	86.2	84.5	84.8	85.2	86.2	87.5	88.2	89.9	91.2	90.3	88.5	85.4	87.7	
1000	88.9	88.6	88.1	85.6	86.8	85.1	84.8	85.4	86.1	87.6	88.3	89.7	91.1	90.6	88.1	84.7	87.5	
1250	89.8	90.1	90.1	87.0	88.0	85.6	85.0	85.3	86.1	87.6	88.3	89.7	90.9	89.4	87.6	84.7	88.2	
1600	94.0	95.1	92.4	93.1	93.6	90.7	87.7	87.8	87.7	88.8	90.5	91.6	92.5	90.0	87.7	87.1	91.1	
2000	102.7	104.4	105.6	103.2	103.5	100.4	96.9	96.0	95.4	95.6	97.4	98.7	99.0	95.0	92.5	90.8	100.1	
2500	92.7	93.0	93.0	91.0	90.9	87.7	86.0	86.7	88.0	89.6	91.1	92.3	94.6	90.6	87.4	85.5	90.9	
3150	95.6	95.2	96.8	94.8	94.3	91.1	88.9	89.1	91.4	93.5	95.8	96.9	97.3	93.6	89.8	86.8	94.6	
4000	98.9	99.6	101.3	99.6	98.6	94.7	91.7	92.2	96.2	97.3	100.1	101.7	102.2	99.1	94.7	90.4	99.3	
5000	95.1	96.3	96.8	95.6	94.8	92.5	90.0	90.5	93.1	94.8	96.5	98.0	99.0	95.1	91.6	88.6	96.2	
6300	94.7	95.0	97.5	96.7	95.5	91.2	89.4	90.5	93.2	94.8	96.7	96.0	98.0	93.9	89.7	87.5	96.3	
8000	93.4	93.5	96.0	96.1	95.1	91.9	88.9	89.6	92.4	94.5	95.9	97.0	98.6	94.1	91.6	87.0	96.7	
10000	90.8	91.3	94.3	95.0	93.8	89.3	85.6	85.9	88.8	90.8	92.3	92.5	93.6	90.3	87.4	84.0	94.5	
12500	89.5	88.3	92.4	93.0	91.9	88.2	83.4	84.4	87.5	89.4	90.4	91.7	92.7	88.9	87.4	82.4	94.4	
16000	86.5	84.8	90.1	90.1	89.3	85.5	81.6	81.3	85.0	86.6	87.6	89.3	91.0	87.8	85.1	81.8	93.9	
20000	84.0	80.3	87.1	86.6	85.2	82.1	78.1	78.1	81.6	83.6	84.3	85.4	86.9	83.7	80.6	80.8	93.0	
OVERALL	107.0	107.9	109.2	107.7	107.4	104.4	101.8	102.0	103.7	105.1	106.8	108.1	109.1	106.8	105.7	103.7	107.5	
SIDELINE PERCEIVED NOISE LEVELS																		
1 METERS	94.5	103.9	109.0	109.8	111.7	110.2	108.4	108.8	111.0	112.2	113.8	114.4	113.9	109.5	104.0	96.4		

(d) Percent of design speed, 90; fan physical speed, 3183 rpm; fundamental blade passage frequency, 2122 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	85.3	80.8	82.6	82.0	86.3	84.6	84.5	87.1	84.8	87.0	87.5	88.2	90.3	92.3	94.8	96.0	88.7	136.1
63	81.6	83.2	82.7	80.1	82.9	82.7	83.1	84.4	84.2	86.4	87.4	89.5	91.6	93.1	96.4	98.1	89.4	136.8
80	82.9	83.2	80.9	79.5	82.7	83.0	83.0	84.2	85.2	87.9	89.4	92.1	94.4	96.9	99.9	100.7	92.1	139.5
100	86.2	87.3	87.2	84.8	85.8	87.2	87.7	89.3	90.3	92.0	93.5	95.4	97.0	99.0	102.0	101.7	94.6	142.0
125	88.3	86.5	87.2	85.5	88.0	89.0	89.7	90.8	91.5	93.2	94.0	95.6	97.0	98.3	100.7	98.7	94.2	141.6
160	87.4	89.1	90.2	87.1	89.7	89.9	90.2	91.4	91.7	92.4	92.7	93.8	95.4	96.6	97.6	95.8	92.9	140.3
200	87.9	88.7	88.0	86.0	88.4	87.5	88.0	88.2	89.2	90.2	91.9	93.3	95.5	96.9	98.2	95.3	92.2	139.6
250	86.9	87.4	87.7	85.2	87.0	87.5	88.4	89.4	90.5	92.2	93.4	95.1	96.7	97.7	97.9	95.6	93.0	140.4
315	85.7	87.2	89.0	87.5	87.9	88.7	89.2	89.9	90.9	91.9	92.9	94.1	96.0	97.0	96.7	93.6	92.5	139.9
400	87.0	87.3	87.8	87.0	89.3	88.8	89.0	89.5	90.3	91.6	92.8	94.2	96.1	97.1	96.1	92.5	92.5	139.9
500	88.1	88.9	89.3	88.3	91.1	89.6	90.1	89.8	90.6	91.4	92.6	94.0	95.1	95.6	94.9	91.7	92.2	139.6
630	88.5	88.0	89.7	88.5	90.0	89.2	89.2	89.5	89.8	91.5	92.5	93.8	95.2	95.2	93.8	89.5	91.8	135.2
800	91.0	91.5	91.6	92.0	92.5	90.8	90.3	90.8	90.5	92.6	93.1	94.6	95.6	95.5	93.8	90.5	92.8	140.2
1000	91.9	92.2	92.4	89.5	91.4	90.0	90.7	89.8	90.4	91.8	92.7	94.3	95.3	94.5	93.2	89.6	92.3	135.7
1250	93.0	94.5	95.0	92.3	94.5	92.2	90.7	90.5	91.0	91.7	92.5	94.1	94.8	93.8	92.3	89.1	93.0	140.4
1600	93.0	93.9	94.4	91.9	93.0	91.4	89.5	89.2	90.2	91.0	92.4	93.5	94.7	93.0	91.3	87.5	92.3	139.7
2000	104.8	107.1	108.1	104.8	105.6	102.9	99.4	97.6	97.1	98.1	99.8	100.7	100.9	96.9	95.3	93.7	102.3	149.7
2500	96.7	98.2	98.9	96.2	96.9	94.9	91.9	91.1	91.9	92.7	94.4	95.9	96.6	93.7	91.6	88.3	95.2	142.6
3150	96.2	95.7	97.9	95.7	96.9	93.9	91.9	91.7	93.4	94.9	96.9	97.6	99.1	93.9	91.6	88.0	96.1	143.5
4000	99.4	99.9	101.6	100.2	100.6	96.6	94.2	95.2	97.9	98.7	101.1	103.6	106.1	100.3	96.8	92.6	101.2	148.6
5000	96.0	97.4	97.7	96.4	96.4	94.9	92.2	91.9	94.9	95.9	97.4	99.7	101.8	98.9	95.7	91.4	98.1	145.5
6300	95.7	96.0	98.6	97.7	97.4	93.7	92.4	92.9	95.9	97.4	99.1	97.2	97.8	94.6	91.3	88.2	97.9	145.3
8000	93.4	93.7	96.4	95.6	94.7	92.4	91.1	92.3	95.8	96.8	97.6	98.1	98.3	94.0	92.2	87.5	97.7	145.1
10000	91.1	91.6	94.5	94.3	93.1	90.1	89.0	89.8	93.6	95.0	96.1	96.5	96.7	93.7	91.2	85.6	97.0	144.4
12500	89.8	88.2	92.6	92.1	90.8	88.1	86.5	87.8	91.6	92.3	93.3	94.6	96.0	91.5	90.5	82.4	96.4	143.8
16000	86.9	84.7	89.9	89.1	88.4	85.2	84.1	84.6	89.9	89.8	90.6	91.5	92.7	89.8	87.6	81.1	95.6	143.0
20000	84.2	80.4	86.6	85.6	84.5	82.0	81.0	81.6	87.6	86.6	87.8	88.5	89.3	86.8	83.4	79.2	95.2	142.6
OVERALL	108.6	110.0	111.2	108.9	109.6	107.1	105.2	105.2	106.7	107.8	109.3	110.5	112.0	110.2	110.2	108.7	110.0	157.4

SIDELINE PERCEIVED NOISE LEVELS

DISTANCE

61 METERS	96.6	106.3	111.5	111.6	114.2	113.1	111.6	111.6	113.6	114.5	115.8	116.7	117.3	112.0	107.4	100.0
305 METERS	69.4	84.3	91.4	92.4	95.8	95.2	94.0	93.9	94.6	95.6	96.5	97.0	96.9	91.5	87.2	79.4

TABLE VIII. - NOISE OF FAN A CONFIGURATION 205 (HARD INLET, TAPED FAN FRAME, HARD EXHAUST, LARGE NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(a) Percent of design speed, 60; fan physical speed, 2124 rpm; fundamental blade passage frequency, 1416 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	74.4	73.2	71.9	72.6	71.4	72.1	72.1	72.7	74.7	73.2	73.6	74.8	75.6	76.6	78.6	79.3	121.8	
63	73.1	72.8	71.3	70.8	70.8	70.9	71.6	71.4	73.9	72.4	73.4	75.0	76.6	78.3	79.4	80.8	122.0	
80	73.1	73.0	70.1	70.3	71.1	71.3	71.1	72.0	74.1	74.5	76.3	77.0	78.6	80.8	82.5	83.2	123.9	
100	73.1	73.0	74.5	73.1	72.6	73.3	75.0	75.5	77.3	77.6	78.8	79.0	81.0	82.3	83.3	82.8	125.7	
125	75.5	75.1	76.5	76.0	76.3	77.0	77.6	77.8	79.1	79.3	80.0	80.5	81.0	81.5	82.8	81.3	126.6	
160	75.6	76.3	76.4	76.8	76.8	77.8	77.6	77.9	79.1	79.1	79.1	79.0	79.8	79.9	80.4	77.8	125.9	
200	76.7	76.6	77.1	76.2	75.6	74.9	74.7	74.9	75.6	76.2	76.7	77.3	78.6	79.6	79.9	77.3	124.2	
250	76.8	77.0	78.0	76.5	76.2	76.2	76.7	77.3	78.2	78.8	79.5	79.8	80.5	80.8	80.3	77.5	125.9	
315	77.6	77.6	77.8	78.5	78.1	77.8	79.0	78.8	79.8	79.6	79.5	79.6	80.0	80.5	79.5	76.5	126.5	
400	78.7	79.4	80.5	80.5	77.2	77.7	76.5	77.5	77.9	78.7	79.7	80.8	81.2	81.2	79.5	76.8	126.7	
500	80.6	79.8	79.3	79.6	77.1	78.6	77.0	78.3	78.6	79.0	79.6	80.0	81.0	80.6	79.0	75.8	126.6	
630	80.1	79.5	75.5	80.1	78.0	77.0	76.8	76.8	77.8	78.6	79.1	78.7	80.3	80.0	77.5	74.8	126.0	
800	83.5	82.6	82.8	82.6	80.8	79.8	78.3	78.6	80.0	80.1	80.5	80.7	82.6	82.0	78.6	75.4	128.2	
1000	87.2	87.2	87.2	86.2	84.2	82.0	80.0	81.0	82.0	82.2	83.7	84.1	86.0	86.2	81.5	77.4	131.5	
1250	90.2	90.9	91.1	90.9	90.2	87.1	83.9	85.9	86.2	86.9	87.1	87.7	89.7	90.2	85.4	83.5	135.8	
1600	91.2	91.7	91.7	91.9	91.4	88.5	85.4	87.4	87.7	88.5	88.9	89.0	91.9	91.4	86.4	84.1	137.1	
2000	89.7	90.4	90.6	89.7	87.7	84.7	82.2	83.9	85.4	86.8	87.1	88.7	90.4	90.3	84.4	81.2	135.3	
2500	90.8	92.0	92.0	91.8	90.0	87.8	84.8	86.1	88.6	89.5	91.3	90.6	92.6	91.8	86.3	81.5	137.7	
3150	91.8	93.1	92.9	93.3	91.3	88.6	85.6	86.8	88.8	91.1	93.1	91.7	93.4	93.4	87.9	83.5	139.1	
4000	90.7	92.5	92.5	92.9	90.7	88.5	84.7	85.8	88.4	90.5	89.3	90.3	92.4	92.0	86.0	82.8	138.2	
5000	89.0	91.2	91.7	92.7	90.2	87.8	83.3	84.3	86.7	88.0	88.3	89.7	91.8	90.7	84.8	80.6	137.5	
6300	88.4	90.6	90.9	91.8	89.8	86.9	81.9	82.6	85.0	86.3	86.3	87.9	89.9	89.3	83.4	79.4	136.7	
8000	86.4	89.2	89.2	91.3	88.2	85.4	80.7	81.4	83.4	85.1	85.4	86.3	88.7	88.1	82.4	78.1	136.1	
10000	84.9	87.9	88.3	89.8	86.8	83.9	78.6	78.9	81.4	82.9	82.9	84.1	86.2	86.1	80.7	76.0	135.3	
12500	83.8	86.0	86.3	88.0	85.1	82.0	76.5	76.1	78.8	80.6	80.4	82.2	84.5	83.4	78.6	73.8	134.7	
16000	81.6	84.1	83.9	85.6	82.4	79.3	73.4	73.1	75.2	77.1	77.6	78.7	80.7	80.1	75.8	71.1	133.8	
20000	79.2	81.6	80.6	82.3	79.1	75.6	69.9	69.4	71.4	73.6	74.1	75.3	76.6	76.1	72.1	67.3	133.1	
OVERALL	100.5	101.8	101.9	102.4	100.5	98.0	94.8	95.9	97.6	98.9	99.6	99.8	101.8	101.5	97.0	94.3	148.1	
DISTANCE																		
SIDELINE PERCEIVED NOISE LEVELS																		
61 METERS	86.8	96.8	101.2	104.2	104.2	103.2	101.1	102.7	104.6	106.1	106.8	105.6	106.2	104.2	96.8	88.8		
113 METERS	77.3	88.7	93.8	97.2	97.5	96.6	94.7	96.3	98.2	99.7	100.3	99.1	99.5	97.3	89.5	81.0		

(b) Percent of design speed, 70; fan physical speed, 2478 rpm; fundamental blade passage frequency, 1652 hertz

FREQUENCY	ANGLE, DEG											AVERAGE SPL	POWER LEVEL (PWL)			
	10	20	30	40	50	60	70	80	90	100	110			120	130	140
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																
50	76.2	73.7	73.7	74.5	74.7	75.5	75.7	76.9	77.7	77.2	78.9	80.5	81.5	82.7	84.0	86.8
63	72.7	74.2	73.4	73.7	74.4	74.4	75.2	74.9	76.7	77.1	78.6	80.1	82.7	83.6	85.4	87.4
80	76.2	75.4	72.9	75.7	75.1	74.6	75.1	76.2	78.1	79.1	81.9	83.2	85.4	86.6	88.9	89.1
100	76.2	75.4	74.6	75.6	75.6	76.9	78.4	79.7	81.6	82.2	84.6	85.1	86.7	88.1	89.9	89.4
125	79.2	78.9	79.2	78.9	79.4	80.6	81.1	81.9	83.2	83.6	85.2	86.0	86.2	87.9	88.7	87.5
160	78.9	79.8	80.3	80.9	81.1	81.6	81.4	82.4	83.1	83.3	84.4	84.5	85.4	86.1	86.9	85.3
200	79.6	79.9	79.4	80.1	79.6	79.1	79.3	79.3	80.9	80.9	82.8	83.7	85.1	85.6	86.3	84.3
250	80.6	80.9	79.4	79.6	79.2	79.6	79.4	81.4	82.6	83.4	84.7	85.0	86.2	86.7	86.4	84.1
315	79.4	81.1	79.4	80.8	81.1	81.3	81.9	82.4	83.4	83.8	84.3	84.7	85.6	85.8	84.9	82.5
400	81.2	82.2	79.9	80.1	80.2	79.9	79.7	80.7	82.2	83.1	83.9	85.2	85.9	85.7	84.7	82.5
500	82.0	80.9	80.2	80.0	79.9	79.4	79.7	80.7	82.0	83.2	83.7	84.1	84.9	85.0	83.9	80.5
630	82.6	81.8	81.6	81.4	80.8	80.8	80.3	80.9	81.6	82.9	83.3	83.7	84.8	84.8	82.8	79.8
800	85.0	84.3	83.8	84.0	83.8	82.7	81.3	81.7	82.8	83.0	83.8	84.6	85.8	85.3	83.3	80.7
1000	87.1	87.6	87.1	86.7	85.7	84.5	82.8	83.5	84.0	84.8	85.8	86.6	87.7	87.5	84.2	81.5
1250	89.1	89.7	89.4	89.1	88.1	85.7	83.4	83.6	84.7	85.7	86.7	87.8	88.1	88.1	84.6	82.1
1600	97.7	99.3	99.7	99.8	101.8	100.3	93.7	91.8	92.0	94.0	95.2	95.3	98.2	97.2	91.3	89.7
2000	91.8	92.4	92.3	91.8	92.4	90.3	85.9	87.1	88.0	89.3	90.0	91.1	92.5	92.0	87.6	84.5
2500	91.1	91.9	91.8	91.8	90.6	88.4	85.8	87.4	88.9	90.3	91.1	93.1	93.8	92.1	87.6	84.7
3150	95.5	96.5	97.0	99.0	97.6	95.6	90.5	91.6	93.0	95.3	97.8	99.9	101.0	96.5	92.0	88.7
4000	91.9	93.7	94.0	94.7	92.8	90.2	86.7	87.9	90.0	91.5	92.5	94.0	95.7	93.5	88.9	86.3
5000	93.2	95.9	97.0	97.0	95.0	92.7	88.9	90.2	91.9	93.7	94.2	95.4	95.7	94.0	89.5	86.5
6300	90.8	93.5	94.3	95.6	93.5	90.6	85.8	86.5	89.3	91.0	91.0	92.6	94.0	92.9	87.3	84.5
8000	89.0	91.7	92.7	95.1	92.6	89.2	84.6	84.9	87.5	89.5	89.9	91.1	92.4	91.7	85.9	82.5
10000	87.1	90.6	91.3	93.4	90.8	87.4	82.4	82.2	84.9	86.7	87.4	88.6	89.7	89.1	83.8	80.3
12500	85.6	88.4	89.4	91.9	89.1	85.1	79.9	79.4	82.2	84.0	84.9	86.9	87.6	86.9	81.9	78.7
16000	83.6	86.3	86.6	88.9	86.3	82.3	76.7	76.1	78.4	80.2	81.7	83.9	84.2	83.9	79.1	75.6
20000	80.9	83.2	83.3	85.5	82.2	78.7	72.5	72.0	74.3	76.3	77.8	79.3	80.0	79.1	75.5	71.8
OVERALL	103.4	105.0	105.4	106.3	105.8	103.8	99.1	99.4	100.8	102.4	103.6	105.0	106.3	104.6	101.3	99.6
SIDELINE PERCEIVED NOISE LEVELS																
61 METERS	89.9	99.7	104.4	108.4	109.2	108.5	105.3	106.6	108.2	109.9	111.0	111.8	111.7	107.4	100.9	93.5

TABLE VIII. - Concluded. NOISE OF FAN A CONFIGURATION 205 (HARD INLET, TAPED FAN FRAME, HARD EXHAUST, LARGE NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(c) Percent of design speed, 80; fan physical speed, 2835 rpm; fundamental blade passage frequency, 1890 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
50	84.0	78.4	81.5	80.5	82.7	81.0	81.0	82.5	84.0	82.7	83.7	84.5	85.9	86.7	88.7	91.4	84.4	
63	78.2	78.7	77.7	78.7	77.9	77.9	78.9	79.6	79.9	81.1	82.4	83.8	86.6	88.2	90.1	92.2	84.0	
80	78.4	79.2	77.5	78.0	77.5	78.4	78.5	81.0	81.7	83.9	85.5	86.5	88.7	91.4	93.2	94.2	86.4	
100	81.9	82.4	84.8	83.3	81.6	82.4	82.1	85.1	85.6	87.6	87.6	89.3	90.6	93.3	94.4	94.8	88.5	
125	82.8	82.8	83.9	83.9	83.8	84.9	86.3	86.9	87.6	88.6	89.6	90.4	90.8	92.4	93.9	92.7	88.9	
160	84.4	84.7	86.2	85.9	85.9	86.4	86.9	87.0	87.5	87.4	88.5	88.9	90.0	91.0	91.2	90.1	88.1	
200	83.9	83.9	83.9	84.2	83.9	83.6	83.1	84.1	85.7	85.9	86.6	88.2	89.7	90.7	91.1	88.8	86.8	
250	83.6	83.6	83.4	83.6	83.6	83.4	83.1	85.8	87.1	87.6	88.6	89.4	90.6	91.8	91.4	89.2	87.8	
315	82.8	83.5	83.3	83.8	84.8	85.3	85.8	86.6	87.1	87.6	88.1	89.2	90.0	91.0	89.8	87.2	87.5	
400	83.6	84.0	84.0	85.1	84.6	83.8	84.5	85.1	86.5	87.3	89.0	89.4	90.3	91.0	89.5	86.7	87.5	
500	83.6	83.6	83.6	84.2	84.6	83.7	84.6	85.2	86.5	86.7	87.5	88.1	89.2	89.7	88.5	85.2	86.7	
630	84.4	84.0	85.0	85.7	85.4	84.7	84.9	84.5	85.7	86.4	86.7	87.5	88.7	88.4	87.0	83.6	86.3	
800	86.1	85.7	86.1	86.1	85.7	84.9	85.1	84.9	86.2	86.6	87.6	88.5	89.9	88.7	86.7	83.6	86.9	
1000	87.7	87.7	87.9	88.5	87.4	85.9	85.7	85.7	87.0	87.7	88.9	89.1	90.4	89.4	87.2	83.5	87.5	
1250	89.1	89.4	90.1	90.1	89.1	86.7	85.6	85.7	86.9	87.5	88.5	89.3	90.4	88.9	86.9	83.6	88.4	
1600	92.9	93.9	95.0	96.1	96.5	92.6	90.5	88.7	89.5	90.0	90.9	92.1	93.4	90.4	87.5	84.4	92.6	
2000	101.6	102.9	104.9	106.7	107.7	103.6	100.4	97.1	97.6	97.4	98.6	99.5	101.4	98.6	95.1	91.0	102.3	
2500	90.2	91.2	91.7	92.0	91.1	88.5	86.8	87.8	89.5	90.2	91.3	92.3	94.0	90.2	87.2	83.6	90.9	
3150	92.8	94.0	94.6	94.3	93.6	90.5	88.8	90.0	92.3	93.0	94.8	96.5	97.2	93.7	89.5	86.2	94.1	
4000	97.2	97.8	99.2	100.4	99.9	96.7	93.7	93.7	97.9	96.9	99.8	102.7	105.0	101.0	94.7	91.2	100.3	
5000	92.4	94.4	95.1	95.6	94.4	91.6	89.4	90.1	93.4	94.6	94.9	96.1	96.7	93.7	89.8	86.4	95.0	
6300	91.9	94.5	95.5	96.9	95.2	92.0	89.5	90.4	93.7	94.9	94.7	96.4	97.6	94.9	90.4	87.2	96.0	
8000	91.0	93.7	94.5	96.2	95.0	91.8	90.0	90.2	93.5	95.3	95.3	97.0	98.5	96.7	91.2	87.5	96.5	
10000	89.3	91.7	93.2	94.7	93.0	89.3	86.8	87.5	91.2	92.0	92.2	94.4	95.2	92.8	88.3	84.6	95.2	
12500	87.2	89.9	91.4	93.0	91.5	87.7	84.5	84.4	88.2	89.5	90.4	91.8	92.5	90.5	85.9	82.5	94.4	
16000	84.5	87.4	88.2	90.0	88.3	85.0	81.7	81.5	85.2	86.7	87.3	88.8	89.8	87.7	83.9	79.5	93.4	
20000	81.7	83.8	84.5	86.3	84.3	81.1	77.6	77.8	81.0	82.5	83.8	85.5	85.6	84.0	80.7	76.2	92.3	
OVERALL	105.5	106.7	108.2	109.5	109.8	106.2	103.7	102.7	104.9	105.3	106.4	108.1	109.7	107.4	104.8	103.2	108.0	
SIDELINE PERCEIVED NOISE LEVELS																		
DISTANCE																		
1 METERS	93.2	102.6	108.2	112.1	114.2	112.1	110.5	109.6	112.3	112.1	113.4	114.6	115.1	110.5	103.6	96.2		

(d) Percent of design speed, 90; fan physical speed, 3189 rpm; fundamental blade passage frequency, 2126 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
50	86.6	81.9	83.9	84.9	85.6	84.9	84.6	86.9	85.4	86.4	86.7	88.5	89.4	92.2	94.4	96.2	88.6	
63	82.5	84.5	83.3	82.8	83.3	83.3	83.5	83.8	84.6	85.3	87.1	89.2	90.5	93.3	95.5	97.2	88.5	
80	83.2	83.9	81.1	82.1	82.6	82.9	82.9	84.9	85.7	88.2	90.1	92.3	93.4	97.2	98.9	100.6	91.9	
100	86.3	86.5	86.3	86.2	84.7	85.8	87.0	88.7	89.7	91.5	93.2	95.1	96.3	99.2	101.5	102.4	94.4	
125	88.6	87.1	87.1	87.4	87.4	88.7	89.1	90.9	92.2	93.2	94.1	95.7	96.6	98.4	100.6	99.1	94.2	
160	88.6	89.1	89.4	88.2	89.2	90.4	90.7	91.2	91.9	93.2	92.7	94.5	95.6	97.4	97.7	96.8	93.3	
200	87.8	88.7	87.3	87.4	88.1	87.8	88.4	88.6	89.6	90.8	91.4	93.5	95.6	96.9	97.9	96.0	92.3	
250	87.5	88.2	87.8	87.6	87.0	87.5	88.3	89.5	91.1	92.5	93.6	95.2	96.3	98.0	98.3	95.9	93.2	
315	87.3	87.7	88.6	89.3	88.1	88.8	89.1	90.1	91.3	92.3	93.1	94.6	96.1	97.5	96.5	94.1	92.8	
400	87.5	87.9	87.9	88.5	89.0	89.0	88.7	89.4	90.5	91.7	92.9	94.3	95.9	97.2	95.7	92.5	92.5	
500	89.0	89.4	89.2	90.7	91.5	88.9	89.9	90.0	90.9	91.9	92.5	94.1	95.5	95.5	94.5	91.5	92.4	
630	89.0	89.0	89.0	92.0	90.7	90.0	89.0	89.7	90.8	91.8	92.8	94.2	95.3	95.7	94.1	90.5	92.3	
800	92.9	91.9	91.8	94.8	93.4	91.4	90.4	90.8	91.3	92.6	92.9	94.5	95.8	95.8	93.6	90.8	93.2	
1000	93.9	93.2	92.8	93.9	94.9	91.9	92.5	90.5	91.4	92.4	93.2	94.5	94.9	95.4	93.2	90.1	93.3	
1250	94.1	96.8	97.2	96.7	96.4	94.7	91.2	90.7	92.1	92.2	92.9	94.3	95.2	94.6	91.9	89.8	94.3	
1600	94.7	94.4	94.8	94.7	94.2	92.5	89.5	89.8	91.0	91.8	93.0	93.8	94.1	93.1	90.6	87.5	92.9	
2000	107.1	107.8	107.9	108.3	107.3	104.9	100.4	99.2	97.9	99.4	100.4	99.9	99.7	96.6	94.7	93.2	103.5	
2500	98.5	99.3	99.3	99.7	98.5	96.3	92.8	92.2	92.3	93.8	95.2	95.8	95.9	93.7	91.4	88.3	96.2	
3150	96.9	98.0	98.2	98.7	97.9	95.7	92.7	92.6	93.9	95.7	97.2	98.7	98.1	94.9	91.7	88.8	96.9	
4000	100.3	101.0	101.3	102.6	100.9	97.8	95.3	95.9	99.5	99.4	102.1	104.6	105.0	101.0	96.0	91.6	101.7	
5000	96.5	97.6	97.1	98.7	97.1	94.1	91.9	91.9	94.2	95.4	96.9	98.7	99.5	97.4	94.1	88.5	97.4	
6300	95.3	98.2	98.8	99.1	97.4	94.4	92.8	93.3	93.9	97.3	97.6	97.6	94.8	95.2	91.4	88.2	97.7	
8000	94.4	95.9	96.2	98.1	95.9	92.4	90.9	90.9	93.6	95.2	96.2	96.6	93.9	93.7	91.1	86.5	96.8	
10000	91.8	93.8	94.4	95.8	93.5	89.8	88.3	88.7	91.0	93.2	94.0	94.4	91.0	92.4	89.9	84.5	95.6	
12500	89.8	91.5	92.0	93.1	90.5	86.8	85.3	85.8	89.0	90.8	91.3	91.8	86.5	89.8	87.0	81.5	94.2	
16000	86.5	88.5	89.2	90.0	88.1	84.2	83.7	83.4	85.7	88.2	89.1	90.2	82.3	87.4	84.9	79.5	93.7	
20000	84.5	86.0	86.6	87.0	85.4	80.7	81.3	79.9	83.6	85.6	86.4	86.9	77.8	85.0	81.9	77.1	93.6	
OVERALL	110.2	111.0	111.2	111.8	110.7	108.4	105.7	105.6	106.7	108.0	109.2	110.6	110.8	110.4	109.8	108.5	110.2	

SIDELINE PERCEIVED NOISE LEVELS

61 METERS	98.3	107.2	111.5	114.7	115.5	114.5	112.3	112.3	114.3	114.9	116.2	117.2	116.2	112.3	106.8	99.8
305 METERS	71.1	85.1	91.3	95.5	97.1	96.7	94.7	94.8	95.3	96.3	96.9	97.5	96.1	91.8	86.8	79.8

TABLE IX. - NOISE OF FAN A CONFIGURATION 206 (HARD INLET, SOFT FAN FRAME, HARD EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(a) Percent of design speed, 60; fan physical speed, 2126 rpm; fundamental blade passage frequency, 1417 hertz

FREQUENCY	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																AVERAGE SPL	POWER LEVEL (PWL)
	ANGLE, DEG																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
	76.8	73.5	75.0	74.3	73.5	74.0	74.8	74.8	75.0	76.0	75.2	76.8	75.5	79.2	80.5	81.0	76.2	123.6
50	74.5	73.2	73.7	72.5	72.8	73.2	73.8	73.5	74.5	74.2	75.2	77.1	76.8	79.8	80.8	81.4	76.0	123.4
63	74.8	74.5	73.0	72.7	72.8	72.5	73.3	73.3	74.8	75.8	77.2	78.4	80.0	82.3	82.8	83.6	77.6	125.0
80																		
100	75.8	76.2	76.0	74.8	73.7	74.7	74.7	75.8	77.3	78.8	79.3	80.9	82.0	83.5	85.2	85.2	79.6	127.0
125	77.2	79.0	77.5	77.0	76.0	76.8	77.0	77.7	79.2	80.3	81.0	81.9	81.8	83.3	84.2	83.4	80.2	127.6
160	77.8	78.4	77.7	77.3	76.8	77.3	77.4	78.1	78.8	79.6	79.1	80.5	80.1	81.3	81.6	80.8	79.1	126.5
200	78.3	79.7	76.7	76.0	75.3	74.8	75.0	74.6	75.8	76.5	77.5	78.6	80.3	80.5	81.6	80.2	77.7	125.1
250	78.7	80.8	78.3	78.2	76.7	76.0	76.2	76.7	77.7	79.7	80.0	81.1	81.7	81.7	81.7	79.9	79.3	126.7
315	79.2	81.3	79.5	78.9	77.7	76.5	76.9	77.2	77.9	79.4	79.5	80.3	81.0	80.9	80.5	78.3	79.1	126.5
400	80.6	82.6	80.9	79.7	78.2	76.2	75.7	76.4	77.6	79.2	79.6	80.7	81.4	81.1	80.2	77.8	79.4	126.8
500	81.1	83.1	80.9	80.2	79.2	76.9	76.2	77.9	78.2	79.1	79.4	80.7	81.7	81.4	79.9	77.1	79.7	127.1
630	82.3	84.0	81.7	81.0	79.0	77.3	76.2	76.8	78.2	79.7	80.2	80.6	81.7	81.2	79.7	76.7	79.9	127.3
800	85.0	85.5	84.0	82.8	80.7	78.5	77.8	78.3	78.8	80.7	81.3	82.3	83.7	83.2	80.3	77.4	81.5	128.9
1000	87.1	87.5	87.0	84.6	83.0	80.1	79.3	79.7	80.4	81.9	82.9	84.0	85.6	84.4	80.7	78.1	83.3	130.7
1250	91.0	91.8	92.0	90.5	87.7	84.2	82.0	81.9	82.2	83.4	85.0	87.0	87.0	84.7	81.9	79.3	86.7	134.1
1600	91.8	93.4	93.9	92.2	88.7	85.2	82.3	82.7	82.5	83.3	85.7	87.3	87.8	85.5	82.2	79.6	87.8	135.2
2000	90.8	91.3	91.0	90.0	86.6	83.3	80.3	80.6	81.5	82.3	84.3	85.7	87.1	85.3	81.5	78.2	86.1	133.5
2500	91.9	93.4	92.9	92.1	89.4	85.4	82.2	82.4	83.1	84.7	86.7	88.0	89.7	88.2	84.1	80.1	88.4	135.8
3150	92.7	94.3	94.5	93.5	90.2	86.4	82.9	83.2	84.2	85.8	88.4	90.7	91.5	91.0	86.2	82.5	90.2	137.6
4000	93.3	94.3	94.3	95.0	91.3	87.3	83.5	83.1	85.2	86.8	88.8	91.0	91.5	90.6	85.6	82.3	90.8	138.2
5000	91.4	92.4	92.6	94.0	90.5	85.3	81.4	80.9	83.1	84.9	86.4	88.9	89.4	88.4	83.8	79.1	89.4	136.8
6300	89.8	92.7	93.2	93.0	90.0	85.3	79.8	79.8	80.2	84.1	84.5	86.4	85.4	87.1	81.6	77.5	88.9	136.3
8000	88.7	90.6	91.4	93.0	89.2	84.0	78.7	78.0	79.9	82.2	83.5	85.4	84.0	85.9	82.0	75.9	88.5	135.9
10000	87.4	90.1	89.8	91.9	87.7	82.2	76.7	75.9	77.7	80.0	81.0	82.9	80.3	83.4	80.4	74.0	87.5	135.3
12500	86.2	88.2	88.2	89.6	85.8	80.1	75.0	73.6	76.5	78.3	79.0	80.3	76.4	81.6	78.0	71.5	87.3	134.7
16000	84.2	86.2	86.2	87.5	83.8	78.2	73.5	71.8	72.8	75.5	76.2	78.2	71.4	78.6	75.8	69.1	87.0	134.4
20000	82.8	84.0	83.7	84.8	81.4	75.3	71.2	69.0	70.6	72.8	73.9	75.0	66.4	75.5	71.9	66.6	87.2	134.6
OVERALL	102.0	103.4	103.4	103.4	100.1	96.1	93.1	93.2	94.2	96.0	97.3	99.1	99.6	99.2	96.4	94.2	100.1	147.5

DISTANCE

SIDELINE PERCEIVED NOISE LEVELS

61 METERS	88.0	98.3	102.6	105.2	103.9	101.5	99.2	99.8	101.2	103.0	103.9	104.9	104.3	102.0	95.6	88.1
113 METERS	78.5	90.3	95.3	97.9	96.9	94.8	92.7	93.4	94.7	96.6	97.3	98.3	97.7	95.1	88.4	80.4

(b) Percent of design speed, 70; fan physical speed, 2481 rpm; fundamental blade passage frequency, 1654 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	79.5	76.0	77.7	78.3	76.7	76.8	77.7	78.7	78.8	79.7	80.0	80.8	80.0	83.7	84.8	86.6	80.3	127.7
63	76.6	77.2	76.4	75.6	75.9	75.6	76.2	76.7	77.6	78.9	78.9	80.3	81.7	84.9	86.1	87.1	80.3	127.7
80	81.8	77.0	76.0	76.0	75.5	75.5	75.2	77.3	78.5	80.2	82.0	82.8	85.2	87.0	89.5	89.6	82.6	130.0
100	78.2	77.0	77.3	76.7	77.2	77.8	78.2	80.0	81.5	83.7	84.8	86.1	87.2	89.5	91.3	90.7	84.8	132.2
125	80.4	81.1	80.7	79.4	79.9	80.4	80.7	82.1	83.1	85.2	86.1	87.2	86.4	88.7	90.6	89.1	85.1	132.5
160	80.5	81.5	81.4	80.7	80.9	81.4	81.9	82.9	83.0	84.0	84.4	85.1	85.4	87.4	87.7	86.8	84.0	131.4
200	80.8	80.9	79.6	79.9	79.4	79.4	79.6	80.3	80.4	81.4	82.8	84.0	85.8	86.9	87.3	85.6	82.8	130.2
250	81.1	82.1	81.4	79.8	79.4	79.8	79.9	81.1	81.9	83.8	84.8	85.7	86.6	87.3	87.9	85.7	83.8	131.2
315	80.7	81.7	81.5	80.2	81.2	80.8	80.7	81.5	82.0	83.7	84.2	84.9	85.7	86.7	86.5	84.1	83.4	130.8
400	82.3	83.2	82.7	81.0	80.8	80.8	80.3	81.3	81.5	83.5	84.7	85.1	86.5	86.7	85.8	82.9	83.6	131.0
500	82.7	83.2	82.8	82.0	81.0	80.5	80.0	81.0	81.8	83.3	83.8	84.8	85.7	86.0	84.5	81.7	83.2	130.6
630	84.2	84.3	83.7	82.5	81.8	80.7	80.3	81.2	81.8	83.7	84.3	84.9	86.3	85.7	84.3	81.0	83.5	130.9
800	86.7	86.0	86.2	84.7	83.2	81.7	81.4	82.0	83.0	84.5	85.4	86.0	87.4	86.5	84.5	81.8	84.7	132.1
1000	88.3	88.0	88.0	86.2	85.0	83.3	82.6	83.0	83.8	85.5	86.3	87.4	88.0	86.8	84.5	81.4	85.8	133.2
1250	90.3	90.4	90.3	88.8	86.8	84.6	83.3	83.3	84.3	86.3	87.6	87.9	88.8	86.6	84.1	81.5	87.0	134.4
1600	97.7	99.9	100.1	100.2	96.7	94.2	90.4	88.4	88.9	91.6	92.9	93.2	92.9	91.2	87.7	85.8	94.8	142.2
2000	92.1	93.6	93.5	92.5	89.8	87.5	84.3	84.5	85.6	87.1	88.8	89.4	91.0	88.0	84.5	81.7	89.3	136.7
2500	93.3	94.4	94.4	93.4	90.5	87.9	84.7	85.3	86.5	88.4	90.4	91.1	92.4	89.9	85.5	82.4	90.5	137.9
3150	95.8	98.1	98.5	98.1	95.1	92.8	88.8	88.3	92.5	93.6	95.3	96.8	97.0	95.0	90.3	86.6	95.4	142.8
4000	94.9	96.2	96.7	96.7	93.7	90.2	86.9	87.0	89.4	91.5	94.2	95.5	95.0	93.2	88.4	85.0	93.9	141.3
5000	94.7	96.0	96.2	96.9	94.2	90.4	86.5	86.4	89.2	90.5	92.5	93.5	93.7	91.7	87.4	83.3	93.5	140.9
6300	92.7	95.9	96.4	96.2	93.4	90.4	84.9	85.1	85.6	88.9	89.6	90.6	89.3	90.4	85.0	81.6	92.6	140.0
8000	91.9	94.3	94.6	96.2	92.6	89.3	83.6	82.9	85.4	87.1	88.9	89.8	87.9	89.1	85.0	79.7	92.3	139.7
10000	90.7	93.2	93.5	95.2	91.2	87.5	81.5	80.7	82.7	85.2	86.5	87.4	84.5	86.7	83.8	77.6	91.7	139.1
12500	89.4	91.4	91.9	92.5	89.4	85.1	79.6	77.9	81.4	82.9	83.9	84.8	80.4	84.4	81.2	74.9	90.9	138.3
16000	87.2	89.2	89.9	90.5	87.7	83.5	78.5	75.5	78.2	80.2	81.3	82.7	75.7	81.8	79.0	72.8	90.7	138.1
20000	85.8	87.3	87.9	87.8	85.3	80.0	76.9	72.7	76.3	77.5	78.8	79.5	70.8	78.7	75.3	70.3	91.0	138.4
OVERALL	104.7	106.5	106.8	106.8	103.8	101.1	97.7	97.5	99.3	101.1	102.7	103.6	103.7	103.0	101.0	99.2	104.1	151.5
DISTANCE	SIDELINE PERCEIVED NOISE LEVELS																	
1 METERS	90.7	101.3	105.9	108.4	107.5	106.5	104.0	104.4	107.2	108.6	109.7	110.0	109.0	105.9	99.9	92.9		

SIDELINE PERCEIVED NOISE LEVELS

DISTANCE	61 METERS	90.7	101.3	105.9	108.4	107.5	106.5	104.0	104.4	107.2	108.6	109.7	110.0	109.0	105.9	99.9	92.5
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TABLE IX. - Concluded. NOISE OF FAN A CONFIGURATION 206 (HARD INLET, SOFT FAN FRAME, HARD EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(c) Percent of design speed, 80; fan physical speed, 2835 rpm; fundamental blade passage frequency, 1890 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
50	84.5	82.5	86.5	87.2	85.2	83.0	82.2	82.8	82.2	83.2	85.3	84.6	85.2	87.2	89.8	92.1	85.5	132.9
63	79.1	77.5	79.3	79.0	79.0	78.8	79.5	81.0	80.3	81.8	83.5	85.4	86.5	89.5	92.0	92.7	85.0	132.4
80	80.0	77.3	78.2	79.0	79.2	78.9	78.9	80.2	81.7	84.2	86.4	87.8	89.7	91.7	94.5	94.5	87.2	134.6
100	81.7	79.3	80.7	81.2	80.9	82.7	82.4	84.5	86.0	87.4	89.5	90.8	92.0	94.5	96.2	96.2	89.6	137.0
125	83.8	82.2	84.0	83.8	84.7	85.0	84.7	87.0	87.3	89.2	90.7	91.4	91.8	94.2	95.7	94.7	89.9	137.3
160	85.2	83.6	85.2	85.2	85.9	86.2	85.7	86.9	87.9	89.2	89.9	90.3	90.9	92.1	93.2	92.6	89.0	136.4
200	84.2	82.6	83.9	84.1	84.1	83.4	84.1	84.6	85.1	86.2	87.6	89.0	91.1	92.2	92.9	91.6	87.8	135.2
250	84.2	82.5	84.2	83.7	83.2	83.3	83.7	85.0	86.7	88.3	89.8	90.9	91.5	92.8	93.0	91.4	88.6	136.0
315	83.8	81.7	85.0	84.7	84.0	84.5	84.8	85.5	86.8	88.0	89.5	90.3	91.0	92.0	92.0	89.2	88.2	135.6
400	84.5	81.2	84.8	84.7	84.7	84.7	84.2	84.7	85.8	87.8	88.8	90.3	91.2	91.8	91.2	88.2	88.0	135.4
500	84.8	81.2	85.1	84.6	84.8	84.1	84.4	85.3	86.1	87.4	88.4	89.5	90.4	90.8	89.9	87.3	87.5	134.9
630	85.9	82.1	86.9	86.4	85.1	84.2	84.2	85.1	86.1	87.6	88.7	89.7	90.6	90.4	89.6	86.4	87.6	135.0
800	87.9	84.3	87.6	86.7	86.1	85.1	84.7	85.4	86.4	88.1	88.9	90.0	90.9	90.7	89.4	86.2	88.0	135.4
1000	89.1	85.9	89.0	87.8	86.5	85.3	85.5	85.8	86.5	88.3	89.1	90.1	91.1	90.0	88.5	85.4	88.2	135.6
1250	90.2	87.4	91.3	89.8	88.0	86.2	85.5	86.0	86.5	88.0	89.5	90.2	90.8	89.6	88.0	84.5	88.7	136.1
1600	94.9	92.3	96.4	95.7	93.2	90.6	87.6	87.6	88.1	88.9	91.1	91.3	91.4	89.2	87.1	85.0	91.5	138.9
2000	103.5	100.8	106.0	105.1	103.0	100.0	96.0	95.2	95.3	94.2	98.0	97.4	97.0	93.8	90.8	89.5	99.5	147.3
2500	92.6	90.4	93.8	93.3	90.8	87.9	86.3	86.6	87.8	89.8	91.5	92.8	93.1	90.0	87.3	83.9	90.9	138.3
3150	95.3	93.1	97.6	96.8	94.1	91.1	88.6	89.4	91.0	93.4	95.8	97.3	96.5	93.5	89.6	87.1	94.7	142.1
4000	99.0	95.8	101.5	102.0	99.2	95.8	92.5	93.2	96.5	97.2	101.0	102.0	101.7	99.7	94.2	91.5	99.7	147.1
5000	94.8	92.9	96.5	97.1	93.8	90.6	88.6	89.1	91.6	93.5	94.8	95.7	94.7	92.3	89.3	85.4	94.5	141.9
6300	94.2	93.0	97.7	98.2	94.6	91.6	88.5	89.7	89.9	93.9	94.4	94.9	93.0	92.5	88.7	85.1	95.1	142.5
8000	93.0	91.2	95.8	98.5	94.5	90.8	87.5	87.8	90.3	92.3	94.3	94.7	92.8	92.1	89.5	84.4	95.2	142.6
10000	91.1	89.6	94.5	96.6	93.0	88.8	85.0	84.3	86.8	89.3	90.4	90.8	88.4	88.9	86.8	80.7	93.6	141.0
12500	88.9	87.3	92.2	94.1	90.7	86.6	82.6	82.2	85.2	87.6	88.6	88.7	85.9	86.7	85.6	78.4	92.8	140.2
16000	85.7	84.2	89.3	91.0	88.0	84.0	80.5	79.2	82.3	85.0	86.0	87.4	84.0	84.5	85.0	76.6	92.2	139.6
20000	83.4	81.6	86.9	87.8	85.6	80.5	77.7	76.3	80.3	82.5	83.5	84.1	83.9	81.7	83.8	74.0	92.4	139.8
OVERALL	107.4	104.9	109.7	109.6	107.1	104.2	101.4	101.7	103.2	104.5	106.8	107.5	107.3	106.5	105.5	104.2	107.1	154.5
SIDELINE PERCEIVED NOISE LEVELS																		
DISTANCE																		
61 METERS	95.1	100.7	109.5	111.7	111.4	109.9	107.9	108.6	110.9	111.9	114.2	114.2	112.8	109.5	103.6	96.5		

(d) Percent of design speed, 90; fan physical speed, 3189 rpm; fundamental blade passage frequency, 2126 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
50	84.4	82.6	83.9	84.9	84.1	86.6	85.4	86.7	85.6	86.1	87.9	88.2	90.2	90.9	93.9	97.6	88.8	136.2
63	81.4	82.7	82.1	81.6	81.6	82.2	82.2	83.6	84.1	84.7	86.7	88.3	90.6	93.2	95.4	98.2	88.9	136.3
80	81.9	83.4	80.6	81.4	81.3	81.8	82.6	83.9	86.6	87.6	90.1	91.9	94.1	95.8	98.4	100.5	91.5	138.9
100	86.0	86.3	84.5	86.0	87.8	87.0	87.1	89.1	91.8	91.3	93.0	94.6	96.1	97.6	100.6	100.4	93.7	141.1
125	86.8	86.2	86.3	86.7	87.8	89.2	89.5	90.5	91.8	92.3	93.5	94.8	95.8	97.7	98.7	97.5	93.2	140.7
160	87.6	88.0	89.5	88.8	89.6	89.8	90.1	90.3	91.3	92.0	92.0	92.9	93.8	95.5	96.5	94.5	92.1	139.5
200	87.8	88.9	88.6	88.1	87.8	87.3	86.6	87.8	88.8	89.8	91.3	92.5	94.4	95.9	96.4	93.2	91.3	138.7
250	85.8	87.1	87.4	87.3	87.1	87.4	88.4	89.3	90.8	92.1	92.8	93.7	95.3	96.4	96.3	94.2	92.1	139.5
315	86.2	86.5	87.9	87.5	88.4	88.7	88.7	89.7	90.7	91.4	93.2	93.3	94.5	95.5	94.9	92.5	91.7	139.1
400	87.9	88.4	89.3	88.9	89.1	88.9	87.9	89.4	90.8	91.8	93.1	93.9	94.8	95.6	93.9	91.5	91.9	139.3
500	89.8	91.3	89.6	89.6	89.0	88.5	89.5	89.3	90.3	91.1	92.3	93.2	94.3	94.6	92.6	90.7	91.5	138.9
630	89.0	88.5	89.0	91.6	90.5	89.5	88.2	89.1	90.3	90.8	93.0	92.7	93.5	93.1	91.3	89.5	91.2	138.6
800	92.3	93.8	92.8	95.3	94.0	91.7	90.7	89.5	91.0	91.5	93.5	93.9	94.3	93.7	91.7	89.7	92.8	140.2
1000	93.6	95.3	95.0	95.3	94.8	93.8	91.6	90.6	92.1	92.1	93.6	94.7	95.3	94.8	92.3	89.8	93.7	141.1
1250	93.9	95.5	97.7	97.7	96.3	95.5	94.3	91.8	91.5	92.0	94.3	94.6	94.5	94.0	92.0	89.6	94.7	142.1
1600	93.4	93.9	94.4	94.4	94.0	92.5	91.2	90.2	91.5	92.0	94.0	94.2	95.1	92.6	90.2	87.2	93.1	140.5
2000	105.0	106.3	107.3	106.5	107.0	104.6	102.3	101.3	101.0	102.3	104.0	104.7	101.5	100.3	98.1	96.5	104.1	151.5
2500	97.1	97.9	98.7	98.1	98.2	96.6	94.1	94.1	94.6	95.7	97.4	98.2	97.4	95.5	92.7	90.3	96.9	144.3
3150	94.4	95.6	97.1	97.5	97.1	95.8	92.6	92.6	94.9	96.5	97.9	99.1	98.0	95.3	91.8	89.1	96.8	144.2
4000	97.2	98.2	99.5	99.5	99.0	97.4	97.1	97.1	101.4	101.2	103.4	104.3	103.9	99.6	95.9	93.8	101.5	148.9
5000	94.2	95.6	96.4	97.4	96.4	94.6	92.7	93.2	96.4	97.1	98.7	98.9	99.9	98.6	94.4	91.4	97.9	145.3
6300	93.5	94.9	96.4	97.0	95.7	93.9	92.4	93.4	96.4	98.0	98.9	99.1	98.9	96.4	92.5	89.7	98.1	145.5
8000	91.9	94.1	94.7	95.9	94.4	92.4	91.1	93.1	96.6	97.6	98.3	98.5	98.3	96.7	91.7	88.8	98.1	145.5
10000	90.2	92.4	93.2	94.2	92.7	90.9	89.6	91.1	94.7	95.9	96.8	96.7	96.6	95.8	91.4	87.7	97.5	144.9
12500	88.2	90.1	90.9	92.2	90.6	88.6	87.3	88.6	92.6	93.6	94.7	95.7	94.9	94.2	89.9	85.7	97.0	144.4
16000	85.4	87.3	87.7	89.4	87.4	85.6	84.7	85.9	89.6	90.8	91.9	92.5	92.3	91.1	86.9	83.6	96.0	143.4
20000	82.1	83.9	84.4	85.6	83.2	81.9	81.3	82.8	85.2	86.9	88.8	88.9	88.4	87.8	84.1	80.2	95.1	142.5
OVERALL	108.3	109.5	110.5	110.3	110.2	108.4	106.7	106.6	108.4	109.2	110.8	111.4	111.1	110.2	109.1	108.4	110.5	157.9

SIDELINE PERCEIVED NOISE LEVELS

DISTANCE

61 METERS	96.6	105.9	110.9	113.2	115.0	114.4	113.4	113.6	115.9	116.2	117.5	117.4	116.0	111.8	106.8	101.0
305 METERS	69.7	84.0	90.9	94.2	96.7	96.6	95.8	96.0	97.0	97.8	98.9	98.5	95.7	92.5	87.3	80.1

TABLE X. - NOISE OF FAN A CONFIGURATION 206 (HARD INLET, SOFT FAN FRAME, HARD EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE, MARGINAL WIND CONDITIONS

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(a) Percent of design speed, 60; fan physical speed, 2171 rpm; fundamental blade passage frequency, 1447 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)	
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160			
50	81.2	81.5	78.0	79.8	81.7	78.7	86.7	87.0	84.8	86.0	83.3	85.6	85.7	87.5	85.7	84.1	84.8	132.2	
63	80.8	83.3	77.7	79.7	81.4	79.6	85.9	86.1	83.9	86.1	83.2	83.2	84.6	85.7	84.4	83.6	84.0	131.4	
80	82.3	83.7	78.5	77.9	81.7	79.7	86.0	85.2	83.7	84.7	82.4	83.3	84.7	85.5	85.5	84.8	83.8	131.2	
100	82.0	83.3	79.0	78.0	81.0	78.5	85.5	83.0	82.5	84.2	82.4	82.8	85.7	86.0	86.2	85.6	83.5	130.9	
125	83.6	84.6	80.8	80.3	81.9	79.6	85.3	82.8	82.1	83.9	82.4	83.9	84.8	84.9	85.8	84.6	83.4	130.8	
160	83.6	84.1	80.7	80.1	81.7	79.6	84.6	81.6	81.2	82.6	81.6	83.3	83.2	84.2	83.6	83.0	82.5	129.9	
200	83.8	82.8	79.2	78.2	80.6	78.6	82.6	80.4	78.9	81.2	79.1	81.7	82.7	83.4	82.6	81.4	81.1	128.5	
250	85.3	83.8	81.4	80.2	80.0	79.2	82.7	80.4	79.2	82.4	81.2	82.8	83.5	83.4	82.9	81.3	81.8	129.2	
315	85.3	84.8	81.9	81.0	80.4	79.4	82.0	80.9	79.5	82.0	80.5	82.0	82.5	82.2	81.5	79.8	81.5	128.9	
400	85.5	84.8	81.7	80.7	80.5	78.5	80.2	78.7	78.2	80.9	80.7	82.4	82.9	82.0	81.0	78.6	81.1	128.5	
500	85.7	85.0	82.5	82.1	80.6	78.6	79.8	78.3	78.5	80.8	80.3	82.2	82.8	81.6	80.1	77.5	81.1	128.5	
630	86.5	85.5	84.3	84.3	81.7	79.0	78.8	78.7	79.3	81.0	80.8	81.6	82.8	81.3	79.8	77.6	81.6	129.0	
800	87.3	86.6	84.3	84.1	82.1	79.6	79.4	78.9	79.6	81.4	81.9	83.5	84.4	83.3	80.6	78.0	82.4	129.8	
1000	88.6	88.1	86.1	85.4	83.7	80.8	80.2	80.2	80.8	82.3	83.2	85.0	85.8	83.8	81.5	78.5	83.7	131.1	
1250	91.8	91.6	89.6	89.4	87.4	83.4	81.3	81.4	81.6	83.1	84.8	87.5	87.3	84.3	82.6	79.5	86.2	133.6	
1600	94.9	94.6	93.5	93.1	90.3	86.1	83.5	83.5	83.5	84.1	86.6	89.1	88.6	86.0	83.6	80.5	88.8	136.2	
2000	92.5	91.8	90.3	89.3	86.6	83.3	80.5	80.6	81.8	82.6	84.1	86.2	87.6	85.5	82.3	78.7	86.2	133.6	
2500	93.9	93.4	92.4	91.7	89.4	85.5	82.4	82.2	83.4	84.9	85.9	87.8	89.9	87.4	83.9	80.3	88.3	135.7	
3150	94.4	94.7	94.3	93.6	90.9	86.6	83.8	83.6	84.9	87.8	88.3	90.6	92.6	90.3	86.6	82.0	90.5	137.9	
4000	94.4	94.7	94.7	94.0	90.9	85.7	83.2	83.0	84.0	86.2	87.7	91.0	92.5	89.4	85.9	81.8	90.6	138.0	
5000	94.3	92.8	93.2	92.9	89.9	86.0	81.9	80.7	83.0	84.9	85.9	90.2	92.0	89.5	85.5	81.3	89.9	137.3	
6300	91.6	92.1	92.7	92.7	89.5	84.3	79.9	79.1	81.2	83.3	84.8	85.4	87.6	85.7	81.2	77.4	88.6	136.0	
8000	89.9	90.1	91.0	90.9	87.5	82.5	77.0	75.8	78.4	81.4	81.8	84.4	86.2	83.4	80.4	74.5	87.4	134.8	
10000	88.3	88.6	89.0	89.3	85.7	80.2	74.7	73.5	76.3	79.2	79.2	81.9	84.2	81.5	78.9	72.8	86.5	133.9	
12500	86.8	86.0	87.1	86.9	83.2	77.9	72.0	71.2	74.0	78.1	77.4	81.2	82.9	78.9	78.1	69.4	85.9	132.3	
16000	85.4	84.7	85.1	84.9	81.4	75.2	69.2	68.7	72.4	76.5	74.9	77.4	81.2	78.2	76.6	68.5	85.9	133.3	
20000	83.0	82.3	83.3	82.4	78.0	72.9	66.5	66.6	70.6	76.4	73.3	75.8	90.3	76.1	75.0	67.6	86.7	134.1	
OVERALL	104.1	103.8	103.2	102.8	100.2	96.3	96.7	95.9	95.7	97.6	97.6	99.9	101.3	99.6	97.5	95.2	100.5	147.9	
DISTANCE																			
61 METERS	90.4	99.2	102.7	104.9	104.4	101.7	101.0	100.9	101.8	104.0	104.0	105.4	105.7	101.5	96.3	88.4			
13 METERS	81.5	91.2	95.3	97.9	97.7	95.2	94.6	94.5	95.5	97.6	97.5	98.9	99.0	95.0	89.1	80.7			

DISTANCE

SIDE LINE PERCEIVED NOISE LEVELS

61 METERS	90.4	99.2	102.7	104.9	104.4	101.7	101.0	100.9	101.8	104.0	105.4	105.7	101.5	96.3	88.4
113 METERS	81.5	91.2	95.3	97.9	97.7	95.2	94.6	94.5	95.5	97.6	97.5	98.9	99.0	89.1	80.7

(b) Percent of design speed, 70; fan physical speed, 2533 rpm; fundamental blade passage frequency, 1688 hertz

FREQUENCY	ANGLE, DEG											AVERAGE SPL	POWER LEVEL (PWL)					
	10	20	30	40	50	60	70	80	90	100	110			120	130	140	150	160
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
50	79.7	78.0	79.2	80.2	80.2	79.4	83.5	83.7	83.0	83.0	84.0	84.3	84.7	85.4	87.0	89.8	83.7	131.1
63	79.7	77.9	77.6	79.6	78.7	77.9	82.9	83.1	81.6	82.6	83.1	83.7	85.2	86.4	87.7	89.4	83.4	130.8
80	79.4	76.9	77.6	79.4	78.4	77.2	83.2	81.9	81.6	82.6	84.4	84.8	87.6	87.7	90.4	91.5	84.6	132.0
100	79.0	77.5	78.3	79.3	78.5	78.8	83.5	83.5	82.5	83.7	86.3	87.1	89.2	90.2	91.5	91.5	86.0	123.4
125	81.0	80.4	80.4	81.4	81.5	80.5	84.2	84.4	84.0	85.0	87.0	87.3	89.4	90.0	91.4	90.6	86.3	133.7
160	81.7	81.7	81.4	82.5	82.5	82.0	84.4	84.4	84.5	85.0	85.9	87.1	87.7	88.2	89.0	88.6	85.5	132.9
200	82.4	80.9	80.8	81.4	81.1	80.8	82.6	82.3	81.1	82.6	84.4	85.4	87.8	87.8	87.9	87.2	84.2	131.6
250	83.4	82.1	81.6	82.3	81.6	80.1	82.4	82.4	82.4	84.3	85.8	86.7	89.3	88.6	88.3	87.2	85.1	132.5
315	82.7	82.4	82.1	82.9	82.1	81.2	82.7	83.1	82.7	83.8	85.2	86.1	88.1	87.7	87.1	85.4	84.6	132.0
400	84.0	83.6	82.6	83.3	82.1	81.3	81.5	82.1	82.0	83.5	85.0	86.7	88.0	87.1	86.5	84.4	84.5	131.9
500	84.2	84.2	83.7	83.6	82.6	81.2	81.4	82.7	82.4	83.3	84.9	85.8	87.6	86.6	85.7	83.2	84.3	131.7
630	85.2	85.2	84.3	85.0	83.5	81.5	81.7	82.0	82.3	83.5	85.2	85.9	87.3	85.8	85.2	82.6	84.4	131.8
800	86.9	86.7	86.2	86.6	84.7	82.9	82.7	83.4	83.1	84.8	85.7	86.6	88.6	87.1	85.6	82.5	85.5	132.9
1000	88.6	88.6	87.1	87.5	86.0	83.8	83.3	83.8	84.1	85.6	86.6	88.2	89.3	87.3	85.3	82.5	86.4	133.8
1250	90.5	90.3	88.8	89.5	88.1	84.5	83.8	84.3	84.6	85.9	87.6	89.2	90.1	87.3	85.1	82.2	87.5	134.9
1600	96.3	100.3	99.6	99.6	97.3	93.3	89.3	89.6	89.1	91.8	91.6	93.2	93.9	91.4	87.3	86.5	94.6	142.0
2000	94.9	94.9	93.4	93.9	92.0	88.4	84.9	85.9	86.0	87.4	88.9	90.5	91.7	88.9	85.4	83.4	90.3	137.7
2500	94.7	94.5	93.9	93.2	91.4	87.9	85.4	86.0	86.7	87.9	89.9	90.7	92.9	90.4	85.9	82.5	90.6	136.0
3150	96.7	98.4	97.7	97.7	96.0	91.3	88.7	89.2	92.2	92.8	95.0	95.8	97.9	94.4	89.9	86.4	95.2	142.6
4000	96.1	97.1	96.6	96.6	94.4	88.7	86.4	87.1	89.4	91.0	93.1	95.5	96.4	93.1	88.9	85.0	94.0	141.4
5000	97.0	96.5	96.0	96.2	94.0	91.0	87.5	86.3	89.0	90.5	91.5	94.8	96.1	93.5	88.8	85.8	94.0	141.4
6300	94.1	95.8	95.7	96.0	93.7	88.4	84.9	84.2	86.2	88.1	89.6	89.5	91.5	90.0	84.2	80.5	92.4	139.8
8000	92.7	94.0	94.0	94.5	92.0	87.2	82.1	81.5	84.0	86.3	87.0	89.1	90.2	87.8	83.7	78.7	91.4	138.8
10000	90.9	92.6	92.4	92.9	90.1	84.7	79.9	78.7	81.9	84.1	84.2	86.5	88.1	85.8	81.4	76.5	90.5	137.9
12500	89.6	90.2	90.5	91.0	87.9	82.7	77.2	76.5	79.7	81.5	82.4	86.2	87.8	84.6	80.7	73.6	90.2	137.6
16000	88.7	88.5	88.5	88.5	86.0	80.0	74.5	73.8	77.5	79.9	80.5	83.2	87.0	82.5	79.4	72.6	90.2	137.6
20000	86.1	86.6	86.4	86.0	82.6	78.2	72.0	71.7	75.6	78.5	78.2	82.1	85.6	81.8	77.1	71.9	90.9	138.3
OVERALL	105.6	106.8	106.2	106.4	104.3	100.3	98.4	98.6	99.5	100.9	102.4	103.9	105.4	103.4	101.6	100.6	104.2	151.6
SIDELINE PERCEIVED NOISE LEVELS																		
DISTANCE																		
61 METERS	91.6	101.7	105.4	108.3	108.4	105.7	104.5	105.3	107.2	108.2	109.5	109.8	110.3	106.0	100.0	93.2		

TABLE X. - Concluded. NOISE OF FAN A CONFIGURATION 206 (HARD INLET, SOFT FAN FRAME, HARD EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE, MARGINAL WIND CONDITIONS

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(c) Percent of design speed, 80; fan physical speed, 2895 rpm; fundamental blade passage frequency, 1930 hertz

FREQUENCY	ANGLE, DEG											AVERAGE SPL	POWER LEVEL (PWL)				
	10	20	30	40	50	60	70	80	90	100	110			120	130	140	150
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
50	85.2	86.0	86.2	86.5	86.9	83.5	85.9	84.4	84.9	88.4	87.4	88.1	88.8	87.4	91.0	92.5	134.8
63	81.4	81.4	80.7	81.2	83.2	81.5	85.0	83.0	82.9	86.5	86.7	87.0	89.8	88.2	91.2	92.4	133.8
80	82.1	80.3	80.1	81.1	83.8	80.3	84.6	82.3	83.4	86.4	87.3	89.2	91.6	89.6	94.9	95.6	135.5
100	83.4	84.1	83.1	83.6	83.4	82.7	84.9	84.9	86.4	89.1	89.2	91.3	93.8	91.9	96.4	96.3	137.3
125	83.9	84.1	84.2	84.2	85.2	85.1	86.2	86.6	88.1	89.9	90.2	92.3	94.1	92.7	96.4	95.3	137.8
160	85.0	85.7	86.0	86.0	87.2	87.4	87.4	88.0	88.4	89.5	90.2	91.3	92.3	91.7	93.7	93.1	137.1
200	85.9	85.0	85.2	84.5	85.0	84.7	85.5	85.7	86.5	87.4	87.5	90.6	91.8	91.0	93.2	91.5	135.8
250	85.7	85.6	84.7	84.1	84.4	84.1	84.6	85.6	87.1	88.7	89.4	91.7	92.8	91.7	93.4	91.8	136.4
315	86.1	86.0	85.6	84.8	85.5	85.0	85.8	87.0	87.6	88.6	89.0	91.1	92.6	90.8	92.6	89.8	136.2
400	86.2	86.2	85.9	85.4	85.7	85.0	85.2	86.0	86.4	88.2	88.7	91.1	92.3	90.4	91.7	88.5	135.9
500	86.3	86.6	86.0	85.1	85.6	84.8	84.6	85.5	86.5	88.0	88.1	90.2	91.7	90.1	90.3	87.5	135.4
630	87.0	87.5	87.0	85.7	85.8	84.8	84.7	85.7	86.7	88.2	88.5	90.6	91.2	89.7	89.5	86.6	135.4
800	88.6	88.9	88.1	87.4	87.2	85.9	85.6	86.1	86.9	88.6	88.9	90.8	91.8	90.1	89.7	86.6	136.0
1000	90.5	90.0	88.8	88.3	88.0	86.0	85.5	86.2	87.0	88.3	88.8	91.1	92.2	89.8	89.2	86.2	136.2
1250	91.3	91.9	90.6	90.1	89.1	86.8	85.6	86.1	86.9	88.3	88.8	91.2	91.8	89.3	88.3	85.5	136.6
1600	95.4	96.0	95.0	95.0	93.3	90.6	86.9	87.1	87.6	88.7	89.9	91.8	92.7	89.2	87.7	85.1	138.9
2000	105.1	106.3	106.4	106.1	104.3	100.9	95.8	94.8	94.8	94.4	96.8	97.7	98.3	94.3	92.1	90.5	148.3
2500	94.3	94.5	94.3	93.8	91.8	89.7	87.0	87.5	88.4	90.0	91.2	93.0	93.9	89.7	87.5	84.6	135.0
3150	96.5	97.5	96.7	96.7	94.7	91.7	89.4	89.4	91.7	93.4	95.1	97.0	97.3	92.9	89.9	86.3	142.3
4000	99.9	100.9	101.4	101.7	100.1	95.8	92.1	92.7	95.7	96.2	99.1	102.2	104.0	97.6	94.6	90.4	147.3
5000	97.3	96.1	96.3	96.5	94.0	92.3	89.3	88.8	91.3	93.2	94.3	97.1	97.9	93.6	90.6	87.4	142.7
6300	96.5	97.1	98.1	98.1	95.8	92.2	89.4	89.7	91.6	94.1	94.9	94.5	95.7	92.7	88.3	86.0	143.2
8000	93.5	95.3	96.0	96.5	93.7	91.0	86.5	86.1	88.1	91.3	91.8	93.2	94.6	91.0	87.2	82.7	141.8
10000	92.1	93.2	94.2	94.4	91.7	88.2	83.6	83.1	85.7	88.4	88.7	89.7	90.6	88.1	84.7	79.3	140.2
12500	90.3	90.9	91.6	92.1	89.6	86.1	81.1	80.7	83.6	87.1	86.6	89.4	89.6	85.6	83.4	76.6	139.7
16000	88.6	88.7	89.4	89.9	87.4	83.4	78.7	78.1	81.8	86.0	84.1	86.8	87.9	86.5	81.4	76.1	139.7
20000	85.6	86.2	87.2	87.1	83.8	80.9	75.6	75.5	79.6	85.1	81.7	85.9	85.0	83.5	78.3	75.4	140.1
OVERALL	108.8	109.6	109.8	109.7	107.9	104.8	101.8	101.8	103.1	104.6	105.9	107.9	109.1	105.6	105.8	104.6	154.9
SIDELINE PERCEIVED NOISE LEVELS																	
61 METERS	96.5	105.6	109.8	112.2	112.4	110.7	108.2	108.5	110.7	111.6	113.0	114.5	114.7	108.3	103.9	96.7	

DISTANCE

TABLE XI. - NOISE OF FAN A CONFIGURATION 207 (SOFT INLET, SOFT FAN FRAME, HARD EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.0002 N/sq m; PWL re 0.1 picowatt.]

(a) Percent of design speed, 60; fan physical speed, 2120 rpm; fundamental blade passage frequency, 1413 hertz

FREQUENCY	ANGLE, DEG										AVERAGE SPL	POWER LEVEL (PWL)					
	10	20	30	40	50	60	70	80	90	100			110	120	130	140	150
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
50	71.7	71.4	74.1	70.9	70.6	71.2	72.1	72.4	72.7	73.6	73.9	77.3	75.4	77.1	78.7	80.1	74.6
63	69.3	72.8	72.8	70.8	70.4	70.1	71.1	72.1	72.1	72.9	74.4	76.0	76.4	78.3	78.9	80.8	74.6
80	70.8	71.8	72.1	70.1	70.1	70.1	70.4	72.4	73.4	74.4	75.9	78.7	78.6	80.6	82.3	83.3	76.5
100	73.1	73.4	73.7	71.9	71.4	73.7	73.4	74.4	76.7	77.6	78.9	80.2	81.2	82.7	83.7	83.6	78.5
125	75.4	75.7	75.4	75.6	75.7	76.1	76.2	76.7	78.6	79.4	80.1	81.2	81.4	82.6	83.2	82.5	79.3
160	75.0	75.0	76.2	76.2	75.9	75.9	77.2	76.9	78.4	79.1	79.2	80.1	79.5	80.7	81.0	79.3	78.4
200	75.8	76.6	75.6	74.8	74.1	74.0	74.3	74.0	75.3	76.0	76.6	79.2	79.8	79.8	80.1	78.8	76.9
250	76.8	77.4	75.9	75.9	74.4	75.1	75.8	76.9	78.1	79.4	80.3	81.7	81.9	81.8	81.3	79.5	79.0
315	77.2	77.7	76.4	76.1	75.2	75.6	76.1	76.9	77.9	79.1	79.2	80.5	80.9	80.9	79.7	77.5	78.4
400	78.5	78.0	77.2	75.5	75.0	75.2	75.0	76.2	78.2	79.3	80.3	81.1	81.7	81.5	79.7	77.4	78.8
500	78.2	77.4	76.7	75.7	75.0	75.2	75.5	76.4	77.9	78.9	79.9	81.8	82.0	81.5	79.0	76.6	78.8
630	78.4	77.4	76.0	75.2	74.7	75.0	75.9	76.4	77.9	79.1	79.9	81.0	82.5	82.0	78.9	75.5	78.8
800	79.0	78.0	76.3	76.0	75.5	76.0	77.1	77.6	79.6	80.7	81.5	82.4	84.3	83.6	79.5	76.8	80.2
1000	79.0	77.3	75.8	75.5	75.3	76.1	77.5	78.1	80.1	81.7	82.8	83.8	85.5	84.6	80.1	77.5	81.1
1250	81.0	79.5	78.2	77.3	77.2	77.0	78.8	79.7	82.0	83.5	85.2	86.3	87.2	85.7	81.5	77.5	83.0
1600	83.4	80.4	79.1	78.4	77.8	77.3	78.8	79.9	82.1	83.8	85.9	86.9	87.1	85.9	81.6	78.2	83.4
2000	78.8	78.2	76.2	75.7	74.7	75.5	76.2	78.7	81.0	81.9	84.5	85.6	87.3	85.7	80.7	76.6	82.4
2500	81.0	79.9	78.1	77.1	76.1	76.4	77.4	80.6	82.8	84.8	86.6	88.1	90.3	89.1	84.0	79.2	85.1
3150	84.8	83.1	82.0	80.0	77.6	78.6	79.8	82.1	84.6	87.4	88.4	90.6	92.1	91.4	86.3	81.5	87.5
4000	86.2	85.5	84.5	84.2	79.8	79.7	80.7	82.0	85.3	86.9	88.8	90.6	91.5	90.8	85.0	81.8	87.7
5000	86.1	85.8	84.8	84.1	79.5	78.1	78.4	80.3	83.3	85.7	86.8	88.9	88.9	88.8	83.3	79.2	86.3
6300	87.5	87.6	87.0	86.7	79.6	79.0	78.1	79.3	82.3	84.5	86.0	87.0	87.0	87.3	81.4	77.1	86.1
8000	86.3	87.1	86.1	87.2	78.3	78.5	76.8	77.2	80.5	82.7	83.3	85.9	84.2	86.2	81.4	76.3	85.5
10000	86.5	88.1	87.7	89.2	79.6	80.6	77.1	75.8	78.8	80.4	81.4	83.1	80.9	83.6	79.6	74.2	86.1
12500	85.5	86.5	86.5	87.6	77.7	79.3	75.8	73.9	76.4	78.2	78.9	80.6	76.8	81.3	77.1	71.1	85.6
16000	83.0	83.5	83.7	84.5	72.5	75.8	73.3	70.3	73.8	75.4	76.2	78.2	71.9	78.1	74.8	68.4	84.5
20000	81.3	81.5	81.2	80.9	68.2	72.7	70.4	67.2	70.0	72.1	73.0	74.9	68.0	74.2	71.0	65.2	84.2
OVERALL	96.5	96.5	95.8	96.1	90.5	90.9	90.9	92.0	94.3	96.1	97.4	99.0	99.7	99.4	95.7	93.3	97.4
DISTANCE																	
SIDELINE PERCEIVED NOISE LEVELS																	
61 METERS	80.8	89.4	93.0	95.4	93.9	95.2	96.7	98.6	101.3	103.1	103.9	104.9	104.6	102.3	95.3	87.4	
113 METERS	71.0	80.7	85.2	88.0	87.0	88.5	90.1	92.2	94.8	96.7	97.4	98.3	98.0	95.4	88.1	79.6	

(b) Percent of design speed, 70; fan physical speed, 2473 rpm; fundamental blade passage frequency, 1648 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	75.9	74.4	74.9	76.4	77.0	76.4	76.0	77.0	77.7	78.4	79.2	80.3	79.9	81.7	84.0	85.6	126.6	
63	73.0	75.7	73.7	74.2	75.2	74.3	74.0	75.2	76.5	77.0	78.0	80.6	81.2	83.3	85.3	86.4	126.7	
80	77.5	76.2	75.5	74.7	74.0	75.3	75.0	76.2	77.5	80.0	81.8	82.8	83.8	86.3	88.2	89.0	129.2	
100	76.0	76.0	75.5	76.2	75.8	77.0	78.2	79.2	80.7	82.5	83.8	84.4	86.3	88.0	90.3	89.7	131.1	
125	78.7	78.7	78.7	79.7	79.5	80.5	80.2	81.7	82.9	83.9	85.4	85.8	86.4	87.9	89.5	88.1	131.7	
160	79.2	79.7	79.9	80.2	80.9	80.9	81.4	82.4	82.4	83.4	84.2	84.8	84.7	86.5	87.4	85.4	130.8	
200	79.4	79.5	79.2	78.7	78.9	78.5	78.5	79.4	79.5	81.4	82.0	83.6	85.0	85.9	86.4	84.1	129.4	
250	80.3	81.0	79.3	78.7	79.0	79.3	79.3	80.5	81.7	84.2	85.2	85.2	86.3	86.8	87.0	84.1	130.8	
315	79.9	80.1	79.2	79.6	79.4	80.6	80.2	81.2	81.6	83.6	84.1	84.7	85.7	86.1	85.4	83.0	130.3	
400	80.9	80.4	79.6	78.6	78.9	79.1	79.4	80.6	81.4	83.6	84.1	85.3	86.1	85.9	84.7	82.3	130.3	
500	80.7	80.3	79.2	79.0	78.5	79.5	79.7	81.0	81.7	83.8	84.3	85.4	86.5	85.8	84.0	81.4	130.4	
630	81.0	80.2	79.3	79.0	78.8	79.3	79.5	80.8	82.0	84.7	85.2	85.6	87.7	86.3	84.0	81.4	130.9	
800	82.0	81.0	79.8	79.3	80.0	80.3	80.7	81.8	83.0	85.2	86.0	86.3	87.8	87.0	84.2	81.2	131.5	
1000	82.1	80.4	79.9	79.6	79.6	80.3	81.1	82.4	83.4	85.8	86.4	87.0	88.4	87.1	84.1	81.1	131.9	
1250	81.7	80.5	79.5	79.2	79.0	79.9	81.0	82.7	83.9	86.0	86.9	87.8	89.0	87.0	83.7	80.8	132.3	
1600	86.1	86.6	84.9	82.4	81.9	82.6	83.4	85.2	87.2	90.2	92.2	93.2	93.1	93.4	87.7	83.8	136.9	
2000	81.9	81.6	80.4	79.6	79.3	80.1	81.0	83.3	84.6	86.8	88.3	89.4	91.1	88.8	84.6	80.9	133.7	
2500	83.4	82.7	81.2	80.4	79.7	80.7	81.9	84.7	86.0	88.4	89.9	91.3	92.9	90.7	85.7	81.8	135.4	
3150	88.2	86.4	85.4	84.2	82.5	83.4	85.7	87.4	91.0	93.2	94.0	96.5	98.7	95.5	90.5	85.8	140.5	
4000	87.7	87.4	85.9	86.1	82.5	83.2	84.0	86.5	89.2	92.0	93.5	94.5	95.7	93.7	88.7	84.5	139.0	
5000	88.9	89.1	87.9	87.6	84.3	83.7	84.4	86.2	88.2	91.4	91.9	93.5	93.7	92.0	87.5	83.7	138.3	
6300	89.3	90.3	89.3	89.5	83.0	83.6	83.6	84.9	87.1	89.7	90.6	91.2	91.4	90.8	85.3	80.7	137.5	
8000	88.5	89.7	88.9	89.4	81.5	81.9	81.2	82.7	85.2	88.1	88.2	89.8	88.9	89.8	84.8	79.8	136.7	
10000	88.0	90.2	89.7	90.9	81.5	83.3	80.1	80.9	83.3	86.0	86.2	87.6	85.3	87.2	82.9	77.6	136.6	
12500	89.1	91.3	91.1	92.0	81.6	85.1	80.3	79.6	80.8	83.9	83.7	85.2	81.6	84.7	80.8	75.6	137.6	
16000	86.4	87.2	87.6	87.7	74.3	80.0	76.4	75.9	78.5	81.4	81.4	82.7	77.1	81.9	78.7	72.5	135.9	
20000	84.7	84.9	85.7	84.6	67.4	77.2	73.2	73.2	74.9	79.0	77.9	79.7	73.6	78.1	75.4	68.5	135.9	
OVERALL	99.0	99.6	98.9	99.1	94.3	95.3	95.2	96.8	98.7	101.2	102.1	103.4	104.4	103.3	100.5	98.3	145.1	
DISTANCE	SIDE LINE PERCEIVED NOISE LEVELS																	
61 METERS	83.8	92.0	95.5	98.2	97.5	99.5	101.5	103.6	106.3	108.4	108.9	109.8	110.0	106.3	99.7	91.7		

TABLE XI. - Concluded. NOISE OF FAN A CONFIGURATION 207 (SOFT INLET, SOFT FAN FRAME, HARD EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(c) Percent of design speed, 80; fan physical speed, 2826 rpm; fundamental blade passage frequency, 1884 hertz

FREQUENCY	ANGLE, DEG											AVERAGE SPL	POWER LEVEL (PWL)					
	10	20	30	40	50	60	70	80	90	100	110			120	130	140	150	160
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
50	81.3	84.3	82.5	85.6	83.5	81.3	81.5	82.6	85.3	85.6	87.6	87.7	86.5	88.1	90.1	90.7	86.0	133.4
63	76.0	79.8	77.0	78.3	77.8	77.8	77.5	79.3	79.6	81.6	83.5	86.5	85.8	88.6	90.5	92.5	84.3	131.7
80	77.5	79.3	77.2	77.3	77.3	78.0	77.5	79.7	81.5	83.7	85.7	88.4	89.7	92.0	94.0	94.7	87.0	134.4
100	78.7	79.7	79.9	80.0	79.7	82.2	82.2	83.4	85.4	87.7	88.9	90.6	91.4	94.0	95.2	95.6	89.0	136.4
125	82.1	82.6	81.6	82.5	82.6	84.6	83.3	85.8	87.6	89.3	89.5	91.0	91.5	94.3	95.1	93.7	89.4	136.8
160	82.5	84.2	83.5	84.3	84.0	86.2	84.8	86.7	87.8	88.5	88.5	90.1	91.0	91.8	92.3	90.9	88.4	135.8
200	82.7	83.5	82.4	83.7	81.5	83.4	82.4	83.4	84.5	86.2	87.4	89.3	90.5	91.7	92.0	89.8	87.2	134.6
250	82.2	83.5	82.5	82.8	81.7	83.3	82.8	84.8	86.5	87.8	89.3	90.4	91.3	92.5	92.2	89.5	88.1	135.5
315	81.6	82.9	81.9	83.2	82.7	84.2	83.7	85.2	86.7	87.7	88.7	90.3	90.9	91.9	90.6	88.1	87.7	135.1
400	82.1	82.9	81.9	82.9	82.3	84.1	83.3	84.8	85.9	87.8	88.4	89.7	91.1	90.9	90.1	86.8	87.4	134.8
500	82.6	82.6	81.9	82.8	82.1	83.4	83.4	84.8	85.9	87.9	88.3	90.0	91.3	90.3	89.3	86.2	87.3	134.7
630	82.8	82.8	82.1	82.8	82.1	83.4	83.3	84.6	86.3	88.1	88.4	90.2	91.4	90.1	88.6	85.1	87.3	134.7
800	84.0	83.5	82.7	83.5	82.7	84.2	84.0	85.3	86.3	88.5	89.3	90.6	92.0	90.5	88.3	85.4	87.8	135.2
1000	84.7	83.5	82.5	83.0	82.5	83.9	84.2	85.2	86.9	88.9	89.4	90.6	91.5	90.2	87.7	85.2	87.7	135.1
1250	84.0	83.2	82.7	83.2	82.7	83.7	83.9	85.2	86.9	88.2	89.5	90.6	91.4	89.4	87.2	84.2	87.6	135.0
1600	84.4	83.7	83.1	82.9	82.6	83.9	84.1	86.1	87.9	89.4	91.7	92.8	92.6	89.4	87.1	84.1	88.8	136.2
2000	89.1	88.3	86.3	87.4	85.9	87.9	88.4	92.4	94.6	94.8	98.8	100.2	98.6	93.1	91.6	89.2	95.1	142.5
2500	84.9	84.4	83.7	83.2	82.9	83.5	84.4	86.7	89.2	90.4	91.8	94.1	94.4	90.7	87.7	84.6	90.0	137.4
3150	87.9	88.0	86.4	85.9	84.7	85.9	87.5	89.4	92.5	94.4	96.5	98.0	97.4	94.2	90.7	86.8	93.8	141.2
4000	90.4	91.1	89.4	90.6	88.4	88.6	91.1	92.1	96.7	97.4	100.6	101.4	100.2	99.1	95.6	91.2	97.6	145.0
5000	89.2	90.2	89.4	89.1	87.6	87.2	87.7	89.9	92.4	94.5	95.5	97.0	95.2	92.8	89.8	86.8	93.7	141.1
6300	90.0	91.5	90.3	90.7	87.7	87.2	87.8	89.1	92.0	93.6	95.3	96.0	94.5	93.0	89.2	85.2	93.8	141.2
8000	89.8	90.7	90.1	91.4	87.7	85.8	87.1	87.4	91.1	92.8	93.4	95.3	93.1	92.3	89.3	84.5	93.5	140.9
10000	88.2	90.3	90.1	91.8	87.8	84.8	86.4	84.7	88.1	90.0	90.5	92.2	88.3	89.8	86.2	81.2	92.2	139.6
12500	88.7	91.8	91.4	92.4	88.3	86.5	86.9	83.6	86.1	88.2	88.4	90.3	84.9	87.2	83.8	78.4	92.8	140.2
16000	88.1	89.5	90.4	90.9	87.5	84.2	86.5	80.4	83.2	86.1	86.1	87.9	81.9	85.2	81.7	76.6	92.5	140.3
20000	85.1	84.0	87.8	84.8	85.7	80.1	86.7	76.7	79.8	83.3	82.8	85.8	78.5	81.3	77.4	73.1	92.7	140.1
OVERALL	100.2	101.2	100.6	101.3	99.1	99.0	99.8	100.9	103.6	104.9	106.9	108.2	107.4	106.4	105.1	103.5	105.6	153.0
SIDELINE PERCEIVED NOISE LEVELS																		
DISTANCE																		
61 METERS	85.2	94.9	98.2	101.8	102.0	103.8	105.9	107.8	111.3	112.2	114.1	114.4	112.4	109.3	104.0	96.4		

(d) Percent of design speed, 90; fan physical speed, 3180 rpm; fundamental blade passage frequency, 2120 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	84.8	80.7	78.7	83.7	80.3	84.7	82.7	85.5	84.3	86.5	87.3	89.8	89.2	92.2	94.2	96.2	88.3	135.7
63	79.6	82.1	80.4	81.7	79.6	82.2	80.6	83.4	83.6	85.7	86.6	89.6	89.9	92.7	95.2	97.6	88.6	136.0
80	81.2	82.2	80.4	81.2	80.4	82.1	80.9	82.7	85.2	88.2	88.9	91.6	92.9	95.1	98.4	100.4	91.1	138.5
100	83.1	84.6	82.8	83.8	81.3	84.8	83.6	87.5	89.3	91.6	92.6	94.2	95.6	98.3	100.0	100.8	93.2	140.7
125	85.7	86.0	84.7	86.5	84.5	88.5	86.0	89.9	91.0	92.9	93.9	95.1	96.5	98.5	99.9	98.4	93.7	141.1
160	86.9	87.9	86.4	87.9	86.5	89.2	87.5	90.2	90.9	92.2	92.9	94.0	94.4	96.5	97.4	96.2	92.4	135.8
200	85.6	87.6	85.7	87.1	84.7	86.9	85.2	87.2	88.4	90.2	91.4	93.3	95.1	95.7	96.4	94.6	91.3	138.7
250	84.7	87.3	85.3	86.0	84.3	87.7	85.8	88.5	90.7	92.5	93.3	94.8	96.0	96.8	96.7	94.5	92.4	139.8
315	84.7	86.2	84.8	86.8	85.2	88.0	86.5	89.0	90.7	91.8	92.8	94.4	95.5	95.8	95.0	93.5	91.8	139.2
400	85.0	86.3	85.3	87.1	85.3	87.5	86.6	88.5	90.0	92.0	93.0	94.4	95.5	95.6	94.5	91.8	91.7	139.1
500	85.3	86.8	85.5	87.0	85.8	88.8	87.7	88.8	90.3	92.2	92.8	94.4	95.2	94.8	93.5	90.1	91.6	139.0
630	85.7	86.5	85.3	86.7	85.0	87.7	86.8	88.5	90.2	92.0	92.8	94.1	94.8	94.3	92.3	89.5	91.2	138.6
800	86.8	87.6	86.1	87.1	86.1	88.4	87.3	89.4	90.6	92.6	93.4	94.7	96.3	94.8	92.6	90.1	91.9	139.3
1000	87.3	87.3	86.3	87.8	86.1	89.3	87.4	89.1	90.4	92.8	93.1	94.7	96.1	94.3	91.8	89.0	91.7	139.1
1250	87.2	87.1	86.4	87.2	86.2	87.6	87.2	88.9	90.7	92.2	93.2	94.8	95.2	93.4	91.1	88.6	91.5	138.9
1600	86.7	86.2	85.9	86.0	85.2	87.2	86.7	88.2	90.2	92.0	93.4	94.3	94.7	92.4	90.0	87.6	91.0	138.4
2000	90.3	91.6	90.9	89.9	87.8	91.6	91.6	95.4	95.6	97.6	103.3	101.6	100.3	97.1	94.1	91.0	97.8	145.2
2500	87.4	87.1	87.1	86.4	86.1	87.4	88.4	90.2	92.4	93.9	96.4	97.5	96.8	93.9	90.6	88.0	93.4	140.8
3150	88.9	89.6	88.9	88.2	87.4	88.7	89.2	91.4	94.7	97.1	98.4	100.0	99.4	94.9	91.4	88.8	95.8	143.2
4000	91.1	92.9	91.9	92.1	89.6	90.3	90.9	93.8	98.1	100.3	102.1	105.1	103.6	99.6	95.3	93.4	100.0	147.4
5000	89.6	91.4	90.6	90.1	89.1	89.1	90.3	91.4	94.6	97.2	98.6	100.0	98.4	96.9	93.2	90.2	96.5	143.9
6300	90.7	92.6	92.4	91.9	89.6	90.1	90.9	92.2	95.7	97.7	99.0	99.9	97.2	95.5	91.9	88.1	97.1	144.5
8000	90.0	91.7	91.1	91.7	89.4	88.0	90.0	91.0	94.3	96.7	96.6	97.7	95.3	94.5	91.0	87.1	96.1	143.5
10000	88.9	90.9	91.3	90.7	88.7	86.4	88.9	88.7	92.5	94.5	94.7	96.1	93.0	93.2	89.7	84.6	95.4	142.8
12500	88.9	90.5	91.2	90.5	89.2	85.4	88.6	86.5	89.0	91.9	92.0	93.0	89.5	90.2	87.6	81.5	94.6	142.0
16000	89.4	91.3	91.6	92.5	90.4	85.9	88.7	84.6	87.0	89.8	90.1	91.1	87.4	88.4	86.2	79.2	95.7	143.1
20000	86.7	85.7	89.4	85.6	88.8	81.6	88.3	82.3	83.7	87.2	87.6	88.4	87.1	85.5	85.1	76.2	95.8	143.2
OVERALL	101.8	103.1	102.6	102.8	101.2	102.1	102.2	104.0	106.3	108.4	110.1	111.3	110.7	109.6	108.9	108.2	108.6	156.0
SIDELINE PERCEIVED NOISE LEVELS																		
DISTANCE																		
61 METERS	87.1	97.2	100.9	104.0	103.9	106.5	107.5	110.4	113.6	115.5	116.7	117.8	115.7	111.4	106.0	99.8		
305 METERS	61.5	74.5	79.5	83.2	83.9	88.2	88.9	92.4	94.5	96.3	98.4	98.1	95.6	91.2	85.9	78.7		

TABLE XII. - NOISE OF FAN A CONFIGURATION 208 (SOFT INLET, SOFT FAN FRAME, SOFT EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(a) Percent of design speed, 60; fan physical speed, 2175 rpm; fundamental blade passage frequency, 1450 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	73.5	70.7	70.2	71.2	70.5	72.2	71.5	72.2	72.5	72.9	73.0	73.8	74.0	77.0	77.7	80.4	73.8	121.2
63	71.6	72.8	70.9	70.5	70.8	71.6	70.5	71.8	71.3	72.1	73.1	74.0	75.5	78.0	79.3	80.7	74.1	121.5
80	74.0	72.2	69.9	69.4	71.9	72.0	70.4	71.4	72.4	73.2	74.4	76.0	77.0	80.5	81.2	82.1	75.6	123.0
100	72.8	72.5	71.4	70.7	71.5	72.5	72.5	74.3	75.7	76.5	77.7	78.9	80.5	82.0	83.5	83.7	77.8	125.2
125	75.5	75.3	74.9	74.6	75.0	75.6	75.6	77.3	77.8	78.8	79.1	79.7	80.6	81.8	83.1	82.2	78.7	126.1
160	75.0	76.3	75.4	75.5	76.0	76.2	76.5	77.5	77.5	78.7	78.2	78.9	79.3	80.5	80.7	79.4	78.0	125.4
200	75.7	76.7	75.2	74.7	74.2	74.1	74.4	74.9	74.7	75.9	76.1	77.5	78.7	79.9	80.1	77.9	76.5	123.9
250	76.7	77.7	75.9	75.5	74.7	74.4	75.0	76.5	77.4	78.9	79.4	80.3	81.4	81.5	81.9	79.1	78.5	125.9
315	76.8	77.5	75.4	75.2	75.8	75.7	76.5	77.3	77.5	78.0	78.2	79.1	80.3	80.5	80.2	76.9	77.9	125.3
400	78.1	78.4	76.8	75.6	75.1	75.1	75.2	76.2	77.1	78.4	78.9	80.2	81.1	81.2	80.2	77.1	78.3	125.7
500	78.6	77.5	76.6	75.8	75.1	74.8	74.8	76.0	76.8	77.8	78.3	79.5	81.0	81.1	79.0	76.5	77.9	125.3
630	78.0	77.8	76.2	75.5	75.0	74.6	75.0	75.6	77.5	78.5	79.7	81.1	80.8	78.6	75.4		77.8	125.2
800	79.5	77.8	76.2	75.3	75.5	74.8	75.5	76.0	77.2	77.8	78.5	79.4	80.8	81.0	78.3	75.4	77.9	125.3
1000	79.3	77.4	75.8	74.7	74.6	74.4	75.2	75.2	76.9	77.4	77.9	78.5	80.1	80.2	77.6	75.4	77.3	124.7
1250	80.4	78.4	76.4	75.5	75.7	74.7	74.9	75.2	76.7	77.2	77.4	78.3	79.5	80.0	77.0	73.9	77.3	124.7
1600	83.3	81.1	79.8	78.6	79.1	76.3	75.5	75.5	76.6	77.0	77.3	77.9	80.0	80.8	77.0	73.9	78.3	125.7
2000	78.9	78.2	75.6	74.7	73.7	72.6	72.6	73.6	74.6	74.7	75.9	77.0	78.6	78.6	75.6	72.1	75.9	123.3
2500	80.4	79.7	76.8	74.8	73.3	72.0	71.7	72.8	73.3	74.3	75.3	77.3	79.0	79.0	75.5	71.4	76.1	123.5
3150	84.4	83.1	80.7	78.1	76.4	73.9	73.2	73.4	74.4	75.4	76.7	78.7	80.7	81.1	78.1	73.0	78.5	125.9
4000	86.2	85.9	84.4	82.1	79.2	76.2	75.4	73.9	75.9	76.7	78.1	80.5	82.2	82.9	78.9	75.2	80.9	128.3
5000	86.9	86.4	84.0	83.4	80.3	75.2	74.7	73.4	74.9	75.2	75.9	79.5	80.2	81.7	77.2	74.2	80.8	128.2
6300	85.7	86.0	86.0	84.6	81.1	75.4	72.8	71.0	71.5	72.7	74.4	75.2	76.4	77.2	75.7	69.2	80.7	128.1
8000	85.7	86.9	86.0	85.6	81.6	76.1	73.6	71.1	73.3	74.6	75.7	78.1	77.0	79.7	75.7	70.1	82.2	129.6
10000	86.5	87.6	87.0	86.8	83.7	77.7	74.7	72.7	75.0	75.0	75.5	76.6	74.2	78.0	75.0	68.8	84.0	131.4
12500	85.6	87.1	86.2	86.4	83.9	77.6	75.3	72.6	75.0	76.0	76.4	79.1	73.6	79.2	75.6	70.1	85.2	132.6
16000	83.3	84.6	84.0	83.1	80.8	75.1	73.9	72.4	75.3	76.1	76.9	77.7	71.6	78.0	74.5	68.9	85.0	132.4
20000	82.9	84.1	82.7	81.7	79.4	73.2	74.0	70.2	73.0	74.6	73.9	75.8	68.4	76.1	72.0	67.2	86.4	133.8
OVERALL	96.4	96.5	95.4	94.6	92.4	89.2	88.7	88.9	89.9	90.8	91.4	92.7	93.5	94.5	93.2	91.7	94.6	142.0
SIDE LINE PERCEIVED NOISE LEVELS																		
DISTANCE																		
61 METERS	80.5	89.5	92.6	93.9	93.8	92.6	92.9	93.0	94.5	95.1	95.6	96.6	96.7	95.6	90.1	82.5		
113 METERS	71.0	80.9	84.7	86.5	86.8	85.9	86.3	86.5	88.0	88.7	89.1	90.0	90.0	88.6	83.0	74.7		

(b) Percent of design speed, 70; fan physical speed, 2538 rpm; fundamental blade passage frequency, 1692 hertz

FREQUENCY	ANGLE, DEG											AVERAGE SPL	POWER LEVEL (PWL)					
	10	20	30	40	50	60	70	80	90	100	110			120	130	140	150	160
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
50	77.3	74.5	76.8	76.6	78.1	78.5	77.0	77.3	77.8	77.1	78.6	78.9	78.6	82.3	83.6	91.5	80.6	128.0
63	74.1	74.8	75.6	75.9	75.4	76.8	76.4	75.8	75.9	76.9	77.8	79.7	80.9	83.6	85.4	90.8	80.5	127.9
80	75.6	74.9	75.4	75.9	75.8	76.9	75.4	77.1	77.9	78.8	80.3	82.2	83.3	85.9	87.9	91.7	82.1	129.5
100	76.6	75.1	77.0	76.8	77.1	79.0	78.1	79.5	81.1	82.6	83.5	84.6	86.3	88.0	90.0	92.7	84.2	131.6
125	78.5	79.4	79.0	79.2	81.4	81.9	80.9	82.0	83.7	84.7	85.5	86.0	86.2	87.9	89.4	89.8	84.7	132.1
160	79.5	79.8	80.5	80.7	81.8	81.8	81.8	82.3	83.0	83.5	83.8	84.1	84.8	86.5	87.0	88.5	83.7	131.1
200	79.3	80.3	80.0	80.0	79.8	79.5	79.3	79.8	79.8	80.7	81.7	83.1	85.0	85.8	85.7	87.2	82.2	129.6
250	79.7	81.0	80.2	79.8	80.3	79.8	80.0	80.8	82.5	83.8	84.3	85.3	86.3	87.2	87.0	86.5	83.6	131.0
315	79.5	80.4	79.7	80.7	80.9	80.9	80.9	81.5	82.2	83.2	83.7	84.5	85.7	86.2	85.2	85.4	83.1	130.5
400	81.0	80.8	80.3	79.8	80.0	80.0	80.2	81.0	81.8	83.5	84.0	85.1	86.0	86.7	85.0	84.2	83.2	130.6
500	81.1	80.3	80.0	79.8	80.0	79.8	80.3	80.5	81.6	83.0	83.6	84.7	86.1	85.8	83.8	82.8	82.8	130.2
630	81.0	80.4	80.0	79.7	79.9	79.4	80.0	80.5	81.7	82.7	84.0	84.6	86.7	85.7	83.4	81.7	82.8	130.2
800	82.2	80.7	80.2	80.2	80.1	80.1	80.6	80.9	81.9	83.2	83.6	84.3	86.2	85.7	83.1	80.5	82.8	130.2
1000	82.2	80.4	79.9	79.6	79.7	79.4	80.1	80.2	81.6	82.9	83.4	83.8	85.6	85.1	82.1	79.5	82.3	129.7
1250	82.2	80.5	79.4	79.2	79.0	78.8	79.7	79.8	81.3	82.5	82.8	83.4	85.0	84.3	81.3	77.5	81.9	129.3
1600	85.3	86.0	83.2	81.8	81.7	81.0	80.3	80.2	81.2	82.2	83.0	83.4	86.0	85.2	81.2	76.7	82.9	130.3
2000	83.3	81.8	79.8	79.1	79.1	78.1	78.3	79.6	79.9	81.3	82.1	82.7	84.8	83.8	80.3	76.3	81.4	128.8
2500	83.2	82.6	79.9	78.7	78.1	77.0	77.0	78.0	78.4	80.0	81.0	82.7	84.2	83.2	79.2	74.5	80.8	128.2
3150	86.8	86.0	84.3	82.7	80.8	78.3	77.8	78.1	79.1	81.1	82.5	83.9	86.6	85.5	81.8	75.4	83.1	130.5
4000	87.8	87.6	85.6	85.0	82.6	79.5	78.6	78.0	79.8	81.6	83.1	84.9	86.6	86.4	82.1	75.5	84.2	131.6
5000	89.3	90.1	87.1	87.5	85.1	80.6	79.9	79.4	80.2	81.7	82.7	84.9	85.0	85.9	80.4	75.7	85.2	132.6
6300	87.7	88.5	88.6	88.1	84.7	80.2	77.2	76.6	76.2	78.5	79.8	79.6	80.6	80.4	79.0	71.1	84.1	131.5
8000	87.9	89.4	88.6	89.1	85.4	80.6	77.7	75.9	77.7	79.7	81.2	81.6	80.8	82.9	78.5	72.8	85.6	132.0
10000	88.0	89.7	89.0	90.2	86.4	81.4	78.4	76.2	76.6	79.0	79.9	80.1	77.8	81.2	77.9	71.0	86.8	134.2
12500	88.8	91.5	90.3	91.8	88.8	83.7	80.7	77.7	78.2	79.7	80.4	81.7	76.9	81.6	77.6	72.3	89.7	137.1
16000	86.2	87.5	87.9	87.8	84.8	80.4	77.5	76.2	77.7	79.9	80.7	81.1	75.9	80.8	77.0	72.7	88.8	136.2
20000	85.9	87.0	86.1	86.6	82.7	78.7	75.6	74.7	77.3	78.8	78.9	79.4	72.1	79.6	75.1	74.4	90.2	137.6
OVERALL	98.8	99.6	98.5	98.9	96.6	94.3	93.5	93.6	94.7	96.0	96.8	97.7	98.8	99.4	98.5	100.1	99.0	146.4
SIDELINE PERCEIVED NOISE LEVELS																		
DISTANCE																		
61 METERS	83.2	92.0	95.1	97.9	98.2	97.1	97.3	97.8	99.1	100.5	101.1	101.5	101.9	100.0	94.5	87.7		

TABLE XII. - Concluded. NOISE OF FAN A CONFIGURATION 208 (SOFT INLET, SOFT FAN FRAME, SOFT EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(c) Percent of design speed, 80; fan physical speed, 2900 rpm; fundamental blade passage frequency, 1933 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	84.1	83.1	84.9	84.4	84.7	80.7	81.4	81.2	81.7	82.6	82.6	84.0	84.6	86.9	89.2	89.5	84.3	131.7
63	78.1	79.1	78.4	78.1	78.4	78.7	79.6	79.9	80.4	81.1	82.6	84.0	85.7	87.5	90.4	90.3	83.7	131.1
80	79.2	77.9	76.2	77.1	77.4	78.4	78.4	79.4	80.9	82.9	85.1	86.3	88.2	91.1	92.4	93.4	85.8	133.2
100	79.9	79.1	79.1	79.2	79.9	80.9	81.6	83.7	84.6	86.6	88.1	89.2	91.1	93.7	94.7	94.5	88.4	135.8
125	83.6	82.1	82.6	82.4	82.9	83.7	84.9	85.9	87.2	88.2	89.2	90.6	91.9	93.4	95.2	93.8	89.2	136.6
160	83.1	83.4	85.3	84.3	85.3	85.8	85.6	86.9	87.4	88.3	88.1	89.0	90.4	91.8	92.4	90.5	88.2	135.6
200	82.7	83.6	83.6	83.7	83.9	83.1	83.7	84.4	84.7	85.4	86.6	87.7	89.7	91.1	91.2	88.6	86.7	134.1
250	82.9	83.8	83.4	83.3	82.4	83.3	83.8	84.4	85.9	87.6	88.4	90.0	91.4	92.4	92.1	88.7	87.5	135.3
315	82.3	82.8	83.1	83.6	84.0	84.3	85.0	86.0	87.0	87.8	87.6	89.7	90.8	92.0	91.0	87.5	87.7	135.1
400	82.7	82.9	82.9	83.5	83.4	83.7	84.2	84.9	86.0	87.4	88.0	89.3	90.9	91.4	90.2	86.6	87.4	134.8
500	82.8	82.5	83.2	83.3	83.5	83.7	84.2	84.8	85.7	87.0	87.8	89.3	91.0	90.5	89.2	85.2	87.1	134.5
630	83.0	82.9	82.7	83.5	83.0	83.2	83.7	84.7	85.7	87.0	87.5	89.1	90.9	90.4	88.5	84.6	86.9	134.3
800	84.6	83.2	83.1	83.6	83.9	83.7	84.6	84.9	86.1	87.4	87.7	89.2	90.9	90.6	88.2	84.4	87.1	134.5
1000	85.0	83.1	83.1	83.5	83.1	83.1	84.5	84.5	85.6	87.0	87.6	89.0	90.3	89.8	87.8	83.8	86.7	134.1
1250	84.8	83.0	82.6	83.1	82.8	82.9	83.6	83.8	85.6	86.8	86.9	88.2	89.6	88.9	86.6	82.7	86.2	133.6
1600	84.7	83.2	82.7	82.9	82.2	82.6	82.7	83.2	84.9	85.7	86.4	87.3	88.6	87.9	85.2	81.8	85.4	132.8
2000	87.8	87.1	86.3	86.3	84.8	84.8	84.3	85.8	85.1	86.8	87.3	88.9	90.6	88.8	86.0	82.6	87.2	134.6
2500	84.6	83.6	81.9	82.1	81.1	80.3	80.9	82.4	82.9	84.4	85.1	86.9	87.8	86.6	83.8	79.5	84.5	131.9
3150	87.8	86.8	85.1	84.3	82.3	80.8	80.9	81.6	82.9	85.1	85.8	87.7	88.1	87.8	85.1	79.5	85.6	133.0
4000	90.7	90.4	89.4	89.4	86.2	83.1	82.4	82.0	84.2	86.5	89.0	90.4	90.7	90.0	86.7	81.8	88.5	135.9
5000	89.3	90.0	87.7	88.2	85.3	82.5	82.5	82.8	83.5	85.0	85.4	88.6	87.4	88.3	84.0	80.8	87.1	134.5
6300	88.5	89.0	89.4	88.9	85.6	82.4	80.9	80.4	80.5	82.7	83.9	84.1	83.8	83.9	83.0	77.1	86.1	132.5
8000	87.9	89.5	89.5	90.0	86.5	82.6	80.4	79.5	81.5	83.5	84.4	85.3	83.2	85.3	82.0	76.8	87.3	134.7
10000	87.1	88.8	88.9	90.1	85.9	81.9	80.1	78.2	79.3	81.5	82.5	83.1	80.6	83.5	80.5	74.6	87.3	134.7
12500	88.0	90.6	90.4	91.9	87.9	83.7	82.3	79.2	80.4	82.1	82.2	83.9	78.4	82.6	79.6	74.2	90.0	137.4
16000	87.3	89.4	89.8	90.2	87.5	83.3	82.0	79.4	80.0	82.5	83.0	83.8	78.2	82.5	79.2	74.3	91.2	138.6
20000	84.7	86.4	86.9	86.7	85.0	80.0	81.6	77.1	79.5	81.5	81.5	83.2	76.8	82.0	78.0	73.5	91.7	139.1
OVERALL	100.0	100.4	100.2	100.6	98.6	97.1	97.3	97.7	98.7	100.1	100.8	102.2	103.3	104.0	103.6	101.5	102.0	149.4
DISTANCE	SIDELINE PERCEIVED NOISE LEVELS																	
61 METERS	85.2	94.2	98.1	101.0	100.8	100.4	101.0	102.1	103.3	104.9	105.8	106.4	105.8	104.0	99.2	91.3		

(d) Percent of design speed, 90; fan physical speed, 3263 rpm; fundamental blade passage frequency, 2175 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	84.3	82.1	82.3	84.4	84.8	84.4	85.1	84.9	85.4	85.8	86.4	87.4	87.9	90.9	93.9	95.6	87.7	135.1
63	80.4	83.6	81.6	82.1	83.3	82.6	82.9	83.6	83.3	84.8	86.6	87.7	89.4	92.8	94.8	96.2	88.1	135.5
80	82.8	81.9	80.8	81.3	81.4	81.8	81.8	83.4	84.9	86.6	88.8	90.2	92.3	95.6	98.3	99.5	90.7	138.1
100	84.4	84.8	82.9	84.3	83.1	84.4	85.3	86.9	89.1	90.8	92.3	93.8	95.3	98.8	99.6	101.6	93.2	140.6
125	87.3	85.6	86.1	86.5	87.0	88.1	88.8	89.5	91.1	92.0	93.0	94.7	96.3	98.6	100.1	98.0	93.6	141.0
160	87.2	87.5	88.5	88.2	89.0	89.5	90.5	90.4	91.2	92.0	91.9	93.5	94.5	97.0	97.2	94.5	92.5	139.9
200	87.1	87.4	87.1	87.6	87.7	87.7	87.7	87.7	88.7	89.7	90.7	92.3	94.4	95.5	96.6	93.2	91.2	138.6
250	87.2	87.1	86.9	86.9	86.2	87.1	87.7	88.9	90.6	91.6	92.6	94.2	95.6	96.9	96.7	94.5	92.2	135.6
315	85.9	86.4	86.6	87.1	87.8	88.1	88.6	89.6	90.6	91.9	92.1	93.7	95.6	96.3	95.3	93.1	91.9	135.3
400	85.9	86.6	86.6	87.2	87.9	87.7	88.6	88.9	90.4	91.6	92.2	93.7	95.2	95.7	94.7	91.5	91.7	135.1
500	86.6	87.1	87.1	87.1	88.2	87.9	88.2	89.1	90.4	91.6	92.4	94.0	94.9	94.5	93.6	90.8	91.5	138.9
630	86.4	85.9	86.2	87.0	87.5	87.4	87.9	88.9	90.0	91.4	92.2	93.8	94.9	94.7	92.9	89.6	91.2	138.6
800	87.9	87.2	86.9	87.6	88.1	87.9	89.1	89.2	90.4	91.7	92.2	94.2	95.6	94.9	92.6	89.6	91.6	135.0
1000	88.2	86.7	86.7	87.7	88.2	88.2	88.2	88.3	90.0	91.5	92.2	93.8	95.0	94.3	92.2	89.2	91.2	138.6
1250	88.3	86.6	87.0	87.3	87.1	87.3	88.0	88.1	90.0	90.8	91.3	93.2	93.8	93.5	90.6	88.5	90.6	138.0
1600	87.6	86.1	85.6	86.2	86.6	86.6	86.9	87.2	88.7	90.0	90.2	91.8	92.9	92.0	89.5	86.5	89.5	136.9
2000	90.2	89.5	89.4	90.2	89.4	88.5	88.2	88.0	90.0	90.9	91.7	93.0	93.7	92.4	89.4	86.5	90.9	138.3
2500	87.9	87.3	86.4	86.9	85.9	85.9	85.8	86.6	87.9	88.9	89.9	91.4	91.9	90.6	88.1	84.5	89.0	136.4
3150	89.1	88.9	87.3	86.4	85.3	84.8	84.9	85.8	87.4	88.9	89.9	91.4	91.3	90.8	87.9	84.7	89.0	136.4
4000	91.9	91.5	89.9	89.9	87.9	86.2	85.9	85.5	88.3	90.2	92.5	94.5	93.9	92.2	88.5	85.2	91.3	138.7
5000	90.6	91.1	88.7	89.2	86.9	85.1	85.4	85.7	87.4	88.9	89.5	92.7	92.4	92.5	88.2	85.2	90.4	137.8
6300	89.8	90.1	90.1	89.6	87.3	84.6	83.6	84.4	84.8	86.9	87.9	87.7	87.5	87.2	86.3	80.8	88.6	136.0
8000	89.3	90.8	89.8	90.2	87.0	84.4	83.3	83.5	85.5	87.4	87.8	88.5	87.0	87.8	85.2	80.6	89.4	136.8
10000	88.9	89.7	89.6	89.8	86.0	83.0	82.4	81.3	83.5	85.3	86.5	87.0	84.5	86.7	83.7	78.3	89.1	136.5
12500	88.1	89.7	89.2	90.2	87.3	83.4	82.4	81.0	83.5	84.6	85.1	86.4	80.5	84.1	81.7	77.2	90.1	137.5
16000	88.5	90.5	91.2	91.2	89.0	84.9	84.0	81.0	83.3	85.0	85.4	86.4	80.2	83.7	81.3	76.0	92.9	140.3
20000	86.8	88.1	88.8	88.4	86.6	82.2	84.0	80.0	82.9	84.6	84.9	86.0	80.5	84.1	81.3	76.2	94.1	141.5
OVERALL	102.2	102.4	102.0	102.3	101.4	100.7	101.1	101.4	102.8	104.1	104.9	106.5	107.4	108.4	108.3	107.2	105.5	152.9
SIDELINE PERCEIVED NOISE LEVELS																		
61 METERS	87.6	96.3	99.9	102.9	103.6	104.0	104.8	105.6	107.5	108.9	109.7	110.6	109.6	107.5	102.8	96.4		
305 METERS	62.5	73.5	79.1	83.2	85.1	86.2	87.3	88.2	90.0	91.0	91.3	91.9	91.2	88.8	84.5	77.8		

TABLE XIII. - NOISE OF FAN A CONFIGURATION 210 (HARD INLET, SOFT FAN FRAME, SOFT EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15°C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(a) Percent of design speed, 60; fan physical speed, 2141 rpm; fundamental blade passage frequency, 1427 hertz

FREQUENCY	ANGLE, DEG											AVERAGE SPL	POWER LEVEL (PWL)					
	10	20	30	40	50	60	70	80	90	100	110			120	130	140	150	160
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
50	70.1	66.8	69.0	68.8	68.8	68.6	69.3	70.1	69.8	70.3	71.5	71.7	73.3	74.8	77.5	78.8	72.0	119.4
63	67.8	68.3	67.3	68.0	67.6	67.3	68.5	68.3	68.6	70.3	71.3	72.4	74.5	75.1	77.5	78.2	71.8	119.2
80	69.6	67.2	66.4	67.4	67.1	67.4	68.2	68.6	69.9	71.7	73.4	74.5	76.7	78.6	79.6	80.5	73.8	121.2
100	69.7	69.1	69.1	69.4	69.2	71.6	71.9	72.2	73.2	74.9	75.9	77.5	79.4	80.2	81.4	82.1	76.1	123.5
125	73.1	71.6	73.1	72.2	72.7	73.4	73.7	74.2	75.7	77.1	77.7	78.5	79.4	80.7	81.2	80.8	77.0	124.4
160	73.1	73.4	73.9	73.4	74.1	74.2	74.6	75.2	75.2	76.6	77.1	77.3	78.1	78.7	79.1	77.8	76.2	123.6
200	73.8	74.3	73.5	73.0	72.0	72.3	72.1	72.0	72.8	73.5	74.1	75.4	76.8	77.5	78.3	76.3	74.4	121.8
250	74.1	74.8	73.9	73.4	72.4	72.4	72.4	73.1	74.3	75.9	76.6	77.7	78.8	79.6	79.1	76.5	75.9	123.3
315	75.2	75.4	75.1	74.2	73.7	73.7	73.9	73.9	74.9	75.9	76.6	77.5	78.2	78.5	77.6	75.3	75.5	123.3
400	76.9	78.2	80.2	78.9	75.7	74.0	73.7	74.2	74.4	75.9	78.0	77.8	79.2	79.2	77.5	74.5	77.1	124.5
500	79.7	80.7	78.6	79.7	76.6	76.6	75.6	74.9	75.6	75.9	77.6	77.8	78.7	78.9	77.4	75.3	77.5	124.9
630	79.6	79.3	78.8	77.8	75.9	74.1	73.3	73.8	73.9	75.3	76.3	77.2	78.3	78.3	75.9	73.3	76.4	123.8
800	82.4	81.6	80.9	79.9	77.9	75.8	74.8	74.1	75.1	75.9	76.6	77.4	78.6	78.6	76.3	74.0	77.6	125.0
1000	84.7	84.7	84.1	82.7	80.6	77.6	76.2	74.8	75.5	76.2	76.5	77.3	78.5	78.7	76.5	74.0	79.2	126.6
1250	88.6	88.8	88.6	87.6	85.6	81.5	78.6	77.1	76.3	77.1	76.6	77.9	79.6	79.5	76.8	75.0	82.7	130.1
1600	89.2	89.9	90.0	89.7	87.9	82.9	79.7	77.5	76.2	77.0	76.5	77.6	79.4	79.2	76.4	74.8	84.0	131.4
2000	88.2	88.7	87.7	88.2	84.8	81.4	76.8	74.8	74.3	74.5	75.7	75.9	78.2	77.3	74.8	73.7	82.2	129.6
2500	90.2	91.5	90.5	90.5	87.8	84.0	79.2	76.5	75.8	75.7	76.0	76.8	79.3	77.8	75.7	74.6	84.7	132.1
3150	90.1	91.4	91.4	91.4	88.6	84.3	79.1	76.4	75.1	75.6	75.9	78.1	80.3	79.4	76.8	75.2	85.5	132.9
4000	90.4	92.2	92.4	92.9	89.7	85.4	80.9	77.1	77.4	78.2	78.7	79.5	82.4	80.7	77.7	76.0	86.5	134.3
5000	89.4	90.6	89.9	91.6	88.4	83.2	77.9	73.7	74.0	74.4	75.2	77.7	79.9	78.7	74.7	73.0	85.4	132.8
6300	87.6	88.5	89.5	89.9	86.9	82.2	74.8	72.4	70.5	71.2	72.2	73.7	76.5	74.5	72.4	69.4	84.3	131.7
8000	86.1	88.4	88.8	90.2	86.8	81.6	74.1	70.3	71.6	72.2	73.7	76.3	78.7	76.6	73.4	69.4	84.9	132.3
10000	85.6	87.2	87.6	88.9	85.4	80.4	72.7	70.7	73.7	72.9	73.4	75.1	77.6	75.3	72.6	68.0	84.7	132.1
12500	85.0	86.5	85.4	87.3	83.6	78.3	71.5	70.3	73.5	74.1	74.9	77.4	78.5	76.6	72.8	68.4	84.9	132.3
16000	82.2	83.6	83.6	84.2	80.7	75.4	69.1	69.5	72.6	73.3	73.6	76.3	76.9	74.9	72.1	66.6	84.4	131.8
20000	79.5	82.3	81.0	82.3	78.0	72.7	66.2	66.9	70.0	73.7	71.8	73.1	73.5	72.2	68.1	64.5	84.8	132.2
OVERALL	99.6	100.7	100.5	101.0	98.1	93.8	89.8	88.2	88.5	89.3	90.1	91.2	92.8	92.5	91.4	90.4	96.5	143.9
SIDE LINE PERCEIVED NOISE LEVELS																		
61 METERS	85.5	95.3	99.7	102.9	101.9	99.3	96.2	94.1	94.4	95.0	95.1	95.3	96.3	93.5	88.6	82.5		
113 METERS	76.1	87.3	92.2	95.6	94.9	92.6	89.6	87.6	87.9	88.5	88.6	88.7	89.5	86.6	81.4	74.5		

(b) Percent of design speed, 70; fan physical speed, 2488 rpm; fundamental blade passage frequency, 1658 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)	
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																		
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160			
50	74.7	72.0	73.2	72.7	73.4	73.7	74.4	74.7	75.5	76.4	76.4	76.6	78.9	80.4	81.7	84.2	124.5		
63	71.2	73.0	71.7	71.2	72.2	72.4	73.0	73.4	73.7	74.2	75.9	76.9	78.9	80.9	82.9	83.9	124.2		
80	78.2	74.8	74.0	71.5	72.0	72.0	72.2	74.0	75.2	76.5	78.8	79.9	82.3	84.0	85.3	87.1	126.8		
100	74.0	73.0	72.4	72.7	73.5	76.5	76.2	77.2	78.5	79.9	81.9	82.4	84.2	86.0	87.0	87.7	128.8		
125	76.5	76.5	76.9	76.4	77.4	78.9	79.0	79.5	81.4	82.0	83.0	83.3	84.4	85.5	86.9	87.1	125.6		
160	77.2	78.0	77.7	77.9	78.7	79.7	79.5	79.9	81.0	81.7	81.9	82.5	82.9	84.2	84.9	84.4	126.8		
200	77.9	77.7	77.6	76.9	77.2	76.4	76.9	77.4	78.6	78.9	80.2	81.2	82.6	83.1	84.2	83.0	127.3		
250	77.9	78.6	77.4	76.7	77.2	76.4	76.6	78.1	79.7	80.6	81.9	82.7	83.9	84.6	85.1	82.6	128.3		
315	77.6	77.8	77.5	77.5	77.5	77.5	77.8	78.6	80.1	80.6	81.1	82.0	82.8	83.3	83.5	81.7	127.8		
400	79.4	79.7	78.9	77.7	77.5	77.2	77.5	78.2	79.4	80.2	81.0	82.1	83.2	83.4	82.5	80.4	127.8		
500	80.2	80.0	79.5	78.3	78.0	77.0	77.2	78.2	79.5	80.2	80.8	81.8	82.8	82.5	81.7	79.7	127.6		
630	81.2	81.6	80.7	79.2	78.6	77.2	77.1	77.9	79.1	80.2	81.1	81.3	82.6	82.4	80.9	78.5	127.6		
800	84.0	83.5	83.0	81.5	80.2	78.9	78.5	78.7	79.7	80.7	81.2	82.0	83.5	82.7	80.9	78.8	128.6		
1000	85.4	85.3	85.0	83.5	82.1	79.9	79.1	78.9	79.8	80.8	81.1	81.7	83.1	82.6	80.4	78.5	129.2		
1250	87.8	87.6	87.1	85.8	84.1	80.9	79.6	78.9	79.8	80.6	80.8	81.5	83.3	81.9	79.8	78.5	130.2		
1600	94.7	96.4	96.4	94.0	93.7	88.0	85.2	82.0	81.9	81.4	81.7	83.1	83.5	83.0	80.7	80.1	136.9		
2000	89.2	90.5	89.5	88.7	87.2	82.7	79.4	78.4	78.9	79.0	79.9	80.5	81.9	80.7	78.5	76.8	131.6		
2500	91.0	92.3	91.7	91.2	88.5	84.7	80.3	78.7	78.5	78.7	79.7	80.1	81.8	80.5	78.0	77.1	133.2		
3150	93.1	94.3	95.5	94.5	92.6	87.8	83.1	80.5	79.6	79.8	81.0	82.8	85.0	82.6	80.6	78.2	136.5		
4000	92.1	94.1	94.1	94.1	91.6	86.8	82.1	78.6	79.3	80.1	81.1	82.6	85.0	82.8	80.1	78.1	136.0		
5000	92.4	93.8	93.3	94.4	91.4	86.8	82.4	78.8	79.6	80.4	80.9	82.2	83.9	81.9	78.7	77.2	136.1		
6300	90.1	91.8	93.0	92.5	90.5	86.0	79.4	77.2	75.4	76.2	77.0	77.7	80.1	77.2	76.3	73.2	135.0		
8000	88.8	91.5	92.1	93.7	90.5	85.9	78.4	74.9	75.9	77.5	78.4	79.4	81.7	79.0	76.4	73.0	135.8		
10000	88.2	90.3	90.8	92.7	89.0	84.7	77.2	73.9	75.8	76.8	77.3	78.7	80.4	77.5	75.9	71.6	135.6		
12500	88.3	90.0	89.3	91.6	88.5	83.0	76.5	74.9	76.8	78.5	79.1	80.9	81.3	78.8	75.7	72.1	136.4		
16000	85.1	87.3	87.5	88.3	85.0	80.0	73.7	73.2	75.9	77.3	77.9	79.5	80.4	78.0	75.6	69.6	135.7		
20000	82.7	85.5	84.6	85.8	82.4	77.5	71.1	71.5	74.0	75.4	75.7	77.0	77.4	75.4	72.1	67.8	136.0		
OVERALL	102.0	103.5	103.7	103.5	101.3	97.0	93.4	92.2	93.1	93.8	94.6	95.5	97.0	96.6	96.4	95.9	147.3		
DISTANCE																			
SIDELINE PERCEIVED NOISE LEVELS																			
61 METERS	87.8	97.9	102.8	104.9	105.0	102.2	99.3	97.9	98.2	98.6	99.0	99.5	100.0	96.9	92.7	86.8			

TABLE XIII. - Concluded. NOISE OF FAN A CONFIGURATION 210 (HARD INLET, SOFT FAN FRAME, SOFT EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - FAR-FIELD NOISE

[Data adjusted to standard day of 15° C and 70 percent relative humidity; SPL re 0.00002 N/sq m; PWL re 0.1 picowatt.]

(c) Percent of design speed, 80; fan physical speed, 2844 rpm; fundamental blade passage frequency, 1896 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	83.7	77.7	78.6	79.1	80.6	77.1	80.1	79.1	80.2	80.4	81.4	82.0	83.7	84.9	87.9	89.5	82.4	125.8
63	74.2	77.2	76.0	74.7	75.7	75.7	76.9	77.5	77.7	78.7	80.2	81.6	84.0	86.0	87.9	89.3	81.6	125.0
80	76.3	76.8	74.5	75.2	75.0	75.3	75.3	77.0	78.7	80.8	83.3	84.8	87.0	88.7	91.2	92.5	84.3	131.7
100	79.9	78.2	81.1	81.7	78.6	78.9	79.2	80.9	83.2	84.9	86.7	87.3	89.9	91.2	93.9	94.1	87.0	134.4
125	81.5	80.2	81.4	81.4	81.9	82.0	82.7	83.9	85.2	86.9	88.0	88.6	89.9	91.4	92.7	92.2	87.3	134.7
160	81.7	82.4	84.1	83.2	83.9	83.4	84.2	84.7	85.4	86.6	87.6	87.6	88.1	90.1	90.9	89.4	86.6	134.0
200	82.9	82.6	83.4	81.6	81.9	81.6	81.6	82.4	82.4	83.6	84.9	86.0	87.7	89.2	89.7	87.8	85.0	132.4
250	81.4	81.9	81.4	80.8	81.3	80.6	81.1	82.8	84.1	85.3	86.8	88.0	88.9	90.4	90.4	87.3	85.5	133.3
315	80.6	81.4	81.9	82.6	81.9	81.4	82.6	83.8	84.6	85.4	86.6	87.5	88.4	89.4	88.8	86.2	85.6	133.0
400	81.2	81.5	81.2	81.2	81.7	81.7	81.9	82.4	83.5	84.7	86.0	87.1	88.7	89.2	88.0	85.2	85.2	132.6
500	82.1	81.6	81.9	81.9	81.7	81.2	81.7	82.9	83.7	84.9	86.1	86.8	87.9	88.6	86.7	83.5	84.5	132.3
630	83.0	82.3	83.0	82.5	81.8	81.3	81.7	82.7	83.5	84.5	85.7	86.6	87.3	87.7	86.3	83.4	84.6	132.0
800	85.0	84.2	84.2	83.9	82.9	82.0	82.2	82.9	84.0	84.9	85.7	86.6	88.4	87.9	86.0	83.1	85.1	132.5
1000	86.6	85.9	85.8	84.9	83.6	82.1	82.6	82.9	83.6	84.6	85.3	86.5	87.9	87.3	85.4	82.5	85.1	132.5
1250	87.6	87.8	87.8	87.3	85.6	83.4	82.8	82.8	83.8	84.8	85.3	86.2	87.3	86.8	84.4	81.1	85.6	133.0
1600	90.6	91.1	92.1	91.8	89.6	86.7	84.1	83.4	83.7	83.9	84.7	85.5	86.6	85.6	83.7	81.1	87.3	134.7
2000	98.6	99.6	101.2	101.2	99.4	96.4	92.4	89.9	87.6	87.1	87.2	87.7	87.4	86.7	85.6	84.5	95.3	142.7
2500	90.5	91.1	91.0	90.6	87.6	84.8	81.8	81.3	81.5	82.0	83.3	83.9	84.8	83.8	81.8	79.4	86.1	133.5
3150	93.8	94.1	94.4	94.0	91.6	88.3	84.3	82.4	82.3	83.1	84.3	85.2	86.3	84.9	82.8	80.5	89.1	136.5
4000	95.4	96.3	97.6	98.4	95.6	91.4	86.9	82.8	83.1	84.3	85.9	87.6	89.9	86.5	84.8	81.5	92.5	139.9
5000	93.2	94.0	93.2	94.7	91.8	88.0	84.3	81.3	82.5	83.2	84.0	85.5	86.1	85.2	81.7	79.5	89.5	136.9
6300	91.6	92.9	93.9	94.3	91.8	88.3	83.3	81.4	79.8	80.9	81.6	83.9	84.6	81.3	80.6	77.2	89.4	136.8
8000	90.2	92.4	93.0	94.9	91.6	88.0	82.4	78.7	79.9	81.4	82.8	83.5	84.8	82.4	80.2	76.4	90.0	137.4
10000	88.9	90.4	91.6	93.6	90.4	86.4	81.1	77.6	78.5	80.6	81.4	83.3	80.8	80.8	78.6	74.5	89.5	136.9
12500	87.8	89.5	89.5	92.5	89.5	85.0	80.0	77.5	79.6	81.3	82.0	82.9	83.0	80.5	77.7	74.2	90.0	137.4
16000	84.6	86.3	87.1	88.8	85.9	82.1	76.9	76.0	78.1	79.5	80.5	82.3	82.4	79.6	77.4	72.1	89.2	136.6
20000	80.7	83.6	83.5	85.7	82.9	79.0	74.2	74.2	76.8	77.3	78.7	79.5	79.9	77.6	74.4	70.4	89.1	136.5
OVERALL	103.9	104.8	105.7	106.2	103.9	100.8	97.8	96.8	97.2	98.1	99.2	100.1	101.4	101.6	101.8	101.1	102.6	150.0
DISTANCE	SIDELINE PERCEIVED NOISE LEVELS																	
1 METERS	91.1	100.2	105.4	108.2	108.1	106.5	104.2	103.1	102.6	103.0	103.6	104.0	104.3	101.3	97.3	91.3		

SIDELINE PERCEIVED NOISE LEVELS

DISTANCE	61 METERS	91.1	100.2	105.4	108.2	108.1	106.5	104.2	103.1	102.6	103.0	103.6	104.0	104.3	101.3	97.3	91.2
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(d) Percent of design speed, 90; fan physical speed, 3199 rpm; fundamental blade passage frequency, 2132 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	83.4	78.7	83.0	80.5	83.2	82.2	82.7	83.5	83.0	84.2	84.9	86.5	88.5	89.9	92.9	94.4	86.6	134.0
63	78.8	81.1	80.1	80.1	79.8	80.3	80.3	80.6	81.1	82.8	84.4	86.0	88.9	90.8	93.1	94.8	86.4	132.8
80	80.3	80.4	78.1	79.1	79.3	79.8	79.9	81.4	83.1	84.8	87.4	89.2	92.1	94.1	97.3	97.6	89.4	136.8
100	83.9	85.4	84.1	84.3	81.9	83.4	84.8	85.1	87.3	89.6	90.9	93.0	94.1	96.9	98.6	99.2	91.9	139.3
125	85.7	83.7	84.2	85.0	84.5	86.2	86.7	87.7	89.0	90.9	91.5	93.3	94.5	96.4	98.7	97.4	92.0	135.4
160	86.1	86.3	86.6	86.3	87.6	88.5	88.0	88.6	89.3	90.8	91.5	91.9	93.1	95.3	96.1	94.5	91.1	138.5
200	85.7	86.2	85.6	85.6	85.4	85.6	86.2	85.9	86.6	88.1	89.2	90.8	93.1	94.6	95.2	92.2	89.7	137.1
250	84.6	85.3	85.3	84.9	84.6	85.9	85.3	86.6	88.1	89.8	91.1	92.8	94.3	95.5	95.6	92.1	90.7	138.1
315	84.4	85.2	86.1	86.4	85.1	86.9	86.9	87.7	88.4	89.7	91.1	92.7	93.9	94.9	94.1	90.0	90.4	137.8
400	84.9	85.4	85.5	85.9	85.4	85.9	86.2	86.9	88.2	89.2	90.5	92.3	93.7	94.4	93.2	89.5	90.0	137.4
500	85.2	86.7	86.9	86.4	86.6	85.9	86.4	86.7	88.1	89.4	90.6	91.3	92.9	93.4	92.2	89.1	89.6	137.0
630	85.7	86.9	87.6	86.7	87.6	86.1	86.7	87.1	87.6	89.1	90.2	91.8	93.2	93.1	91.2	87.6	89.6	137.0
800	90.0	89.6	89.6	90.5	89.0	87.6	87.8	88.0	88.1	89.6	90.8	92.2	93.5	93.5	91.3	87.7	90.4	137.8
1000	89.7	91.0	90.3	90.7	90.0	89.3	87.5	88.7	88.2	89.3	90.3	91.8	93.2	92.8	90.7	87.2	90.4	137.8
1250	90.9	91.6	92.1	93.1	90.9	89.7	88.1	87.7	87.9	89.6	89.9	91.5	92.6	91.9	89.4	86.4	90.6	138.0
1600	91.7	91.4	91.7	91.6	90.5	88.9	87.0	86.0	87.0	88.4	88.9	90.1	91.4	90.4	87.9	85.1	89.6	137.0
2000	103.1	104.4	103.7	106.4	104.6	99.9	95.4	93.9	89.9	90.9	92.9	91.7	93.7	91.6	91.6	90.1	99.7	147.1
2500	95.4	96.3	95.4	97.4	95.6	91.3	88.1	86.9	86.0	87.0	88.5	89.2	90.0	88.6	87.3	84.5	92.0	135.4
3150	95.4	95.6	96.0	95.8	93.8	90.9	88.1	85.8	85.9	86.9	88.0	89.1	90.0	88.6	86.3	84.4	91.5	138.9
4000	98.2	98.9	99.2	101.4	97.1	93.7	90.9	86.4	87.4	89.6	92.1	93.4	96.6	90.5	87.9	85.2	95.6	143.0
5000	95.3	95.3	94.8	96.5	93.3	90.2	87.8	84.0	85.3	87.0	87.8	89.6	91.8	90.2	86.7	83.2	92.0	135.4
6300	94.0	94.5	95.2	95.7	92.5	90.2	86.9	85.4	83.7	85.5	86.5	86.2	87.9	85.3	84.5	81.1	91.4	138.8
8000	92.1	93.8	93.6	95.0	92.1	88.8	85.4	82.4	84.0	85.6	86.3	87.6	88.5	85.7	84.1	80.2	91.3	138.7
10000	90.7	91.7	91.8	93.2	90.5	86.8	83.5	80.9	82.0	83.7	84.5	85.1	87.0	84.4	82.9	78.0	90.5	137.9
12500	89.0	90.2	89.5	91.5	88.5	84.7	81.5	79.7	82.1	83.6	84.4	85.4	85.5	82.5	80.2	76.6	90.4	137.8
16000	85.8	86.8	87.5	88.2	85.0	81.0	78.2	78.2	80.4	81.9	83.1	84.1	84.5	81.5	79.1	74.5	89.9	137.3
20000	81.8	84.2	84.0	85.3	81.8	78.6	75.7	76.4	79.1	80.1	81.2	82.0	82.4	80.4	77.2	73.2	90.2	137.6
CVERALL	107.2	108.0	107.8	109.6	107.5	104.1	101.6	100.9	100.9	102.4	103.7	104.9	106.5	106.8	107.1	106.0	106.1	153.5
SIDELINE PERCEIVED NOISE LEVELS																		
DISTANCE																		
61 METERS	94.9	104.1	107.9	112.4	112.3	110.1	107.9	107.1	106.0	107.6	108.8	109.1	110.1	105.9	102.4	96.2		
305 METERS	67.5	81.9	87.7	93.2	93.9	92.3	90.4	89.9	88.7	89.9	90.8	90.2	90.5	87.4	83.6	76.3		

TABLE XIV. - NOISE OF FAN A CONFIGURATION 210 (HARD INLET, SOFT FAN FRAME, SOFT EXHAUST, NOMINAL NOZZLE)

TEST PURPOSE - INLET-DUCT NOISE

[Data adjusted to standard day of 15°C and 70 percent relative humidity; SPL re 0.00002 N/sq.m; PWL re 0.1 picowatt.]

(a) Percent of design speed, 60; fan physical speed, 2143 rpm; fundamental blade passage frequency, 1428 hertz

FREQUENCY	ANGLE, DEG														AVERAGE SPL	POWER LEVEL (PWL)	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140			150
1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
50	76.0	76.2	77.2	78.7	75.7	76.2	77.7	73.7	73.9	74.9	76.0	76.8	75.5	79.7	87.7	82.4	78.6
63	74.5	75.6	76.6	76.9	74.4	75.2	76.2	71.6	72.7	74.1	75.7	75.7	76.4	79.4	86.9	82.3	77.8
80	75.0	76.0	76.4	76.0	74.7	74.9	76.2	73.2	73.0	75.0	76.4	77.1	79.0	80.7	88.0	83.5	78.8
100	75.6	76.2	77.6	78.1	76.2	76.4	77.9	75.7	77.2	77.1	78.7	80.3	81.7	83.4	88.4	83.8	80.3
125	77.3	78.4	78.9	79.9	77.9	78.3	79.1	77.9	79.4	78.8	80.1	81.8	82.1	83.6	87.9	83.5	81.0
160	79.3	80.0	80.0	80.9	79.2	78.4	79.7	79.2	79.2	79.4	79.9	81.0	80.7	81.5	86.4	81.3	80.6
200	79.1	79.6	79.6	78.7	77.2	76.4	77.2	76.6	76.4	77.9	77.7	79.0	80.1	80.6	84.9	79.6	78.9
250	78.3	79.4	79.4	79.6	78.1	78.4	77.6	78.1	79.3	79.3	80.6	82.0	81.9	83.1	85.1	79.5	80.4
315	79.1	80.0	81.1	80.3	79.0	79.0	78.8	79.1	79.0	79.3	80.0	80.7	81.1	82.0	84.3	78.5	80.2
400	80.5	81.6	83.3	84.3	82.6	79.6	78.8	79.1	79.6	80.3	81.3	81.6	82.5	82.6	83.5	77.7	81.5
500	81.5	83.5	82.2	83.0	81.9	80.5	80.0	80.2	80.4	81.4	81.0	81.6	82.7	83.0	83.5	77.5	81.7
630	82.3	82.2	82.7	82.9	81.4	80.2	79.7	80.5	80.4	80.9	80.7	81.5	82.2	82.2	83.2	77.1	81.4
800	85.6	84.7	85.2	84.7	83.2	82.1	81.4	82.1	81.6	83.1	81.6	81.3	82.6	82.1	82.2	76.8	82.7
1000	87.8	87.4	87.2	86.0	84.4	82.3	81.8	82.3	81.6	84.0	81.8	82.4	82.4	82.1	82.3	76.7	83.6
1250	91.0	91.8	92.2	90.5	88.5	85.3	83.3	82.2	81.8	84.8	81.8	82.1	82.7	82.7	82.5	77.2	86.3
1600	92.3	93.9	94.9	92.4	90.9	87.7	84.2	81.7	81.2	85.5	81.7	82.0	82.9	82.4	82.2	77.3	88.0
2000	90.8	91.1	90.7	90.6	87.9	84.1	80.7	79.1	78.9	83.1	79.7	80.0	81.1	81.1	79.7	74.8	85.3
2500	92.4	92.8	92.8	92.3	90.3	85.8	81.5	80.2	79.8	83.7	79.3	80.3	80.8	81.0	80.7	75.4	87.0
3150	92.3	93.1	93.8	93.5	91.1	86.6	82.1	79.6	79.3	83.8	79.4	80.9	81.8	81.8	80.9	75.7	87.9
4000	92.7	93.6	94.6	94.9	91.8	87.4	82.9	81.1	80.6	85.4	81.6	82.7	83.1	83.4	81.7	76.7	89.1
5000	92.4	92.4	92.7	93.9	91.4	86.4	81.0	77.7	78.3	82.7	79.5	80.3	80.0	81.7	80.8	73.8	88.1
6300	90.0	91.1	90.8	92.3	89.6	84.1	78.8	75.9	74.7	79.9	75.5	76.8	76.9	78.3	76.9	71.4	86.7
8000	88.4	90.1	90.5	92.0	89.0	83.8	78.1	74.9	74.7	80.0	76.6	78.1	77.6	80.1	77.9	71.6	86.9
10000	87.1	88.3	88.5	90.5	87.5	81.8	76.7	74.9	75.5	79.5	76.3	77.5	75.0	78.5	77.1	69.8	86.4
12500	85.7	86.3	87.0	88.0	84.6	80.0	75.5	73.8	75.9	79.6	77.6	78.6	74.2	79.0	78.8	70.2	86.1
16000	83.4	84.0	83.5	84.2	81.9	76.2	74.3	72.0	73.7	77.1	76.4	76.0	72.4	76.5	76.5	68.1	85.1
20000	80.5	81.5	82.1	82.1	79.6	73.7	73.9	68.5	70.6	74.5	73.1	73.2	69.8	73.1	74.1	67.2	85.6
OVERALL	102.0	102.8	103.2	103.2	100.8	96.9	94.2	93.0	93.0	95.7	93.8	94.6	95.0	95.8	98.2	93.0	99.1
SIDELINE PERCEIVED NOISE LEVELS																	
61 METERS	88.1	97.6	102.5	105.4	104.8	102.2	99.6	98.5	98.4	101.9	98.6	98.8	98.0	96.7	94.0	84.2	
113 METERS	78.8	89.6	95.2	98.2	97.9	95.5	93.1	92.1	92.0	95.4	92.1	92.2	91.3	89.7	87.0	76.7	

(b) Percent of design speed, 90; fan physical speed, 3212 rpm; fundamental blade passage frequency, 2141 hertz

FREQUENCY	ANGLE, DEG																AVERAGE SPL	POWER LEVEL (PWL)
	1/3-OCTAVE BAND SOUND PRESSURE LEVEL (SPL) ON 30.5-METER RADIUS																	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160		
50	86.9	84.7	87.4	83.4	85.9	84.5	84.0	87.2	84.9	86.0	86.4	87.5	87.9	91.5	93.5	94.4	87.9	135.3
63	83.3	84.7	85.2	81.7	81.8	82.2	82.8	84.2	83.8	84.3	86.2	87.1	89.2	92.5	94.8	94.6	87.8	135.2
80	84.1	84.6	83.1	81.6	81.0	82.0	82.8	84.5	85.1	87.3	88.6	90.5	92.6	95.2	98.1	96.2	90.2	137.6
100	86.2	87.5	86.2	85.4	84.4	86.5	87.9	88.5	90.0	91.4	92.7	94.1	95.7	98.2	100.0	97.6	93.1	140.5
125	88.9	87.3	87.8	87.6	87.4	88.3	89.1	90.4	91.3	92.4	92.9	94.5	95.8	97.9	99.4	96.3	93.2	146.7
160	88.9	89.8	89.9	89.9	90.6	89.9	90.4	91.1	91.6	92.3	92.9	93.5	94.6	96.3	97.3	93.5	92.7	140.1
200	89.0	89.8	88.0	88.5	87.5	87.3	87.7	88.0	89.3	90.5	91.2	92.8	94.7	96.3	96.5	91.5	91.5	138.9
250	88.2	89.2	88.4	87.9	87.9	88.2	89.5	90.2	91.7	92.9	93.7	94.6	95.7	97.2	96.9	92.4	92.8	146.2
315	87.7	88.9	89.4	89.9	89.4	89.2	89.9	90.7	91.4	92.1	92.6	93.6	95.7	96.6	95.6	91.1	92.4	139.8
400	88.9	89.2	89.7	89.6	88.7	88.6	89.1	90.1	91.2	92.4	92.9	94.2	95.6	95.7	95.1	89.8	92.3	135.7
500	89.7	90.4	90.4	90.7	90.4	89.2	89.7	90.6	91.4	92.4	92.6	93.7	95.6	95.1	94.2	89.5	92.3	135.7
630	90.9	91.6	91.9	92.4	91.6	91.1	91.2	91.6	91.7	92.2	93.1	94.0	94.8	95.1	93.6	88.5	92.7	140.1
800	93.6	93.4	93.1	93.8	93.1	91.8	91.9	93.1	93.6	93.8	93.8	94.5	95.3	95.3	94.1	88.8	93.7	141.1
1000	93.8	94.5	94.8	94.3	94.3	91.5	91.8	92.1	93.0	93.6	93.3	93.9	95.1	95.1	93.3	88.2	93.6	141.0
1250	95.6	96.1	96.6	96.7	95.6	92.9	92.1	92.9	93.1	93.1	92.9	93.3	94.3	93.9	92.1	87.5	94.1	141.5
1600	95.7	96.3	96.8	96.2	95.1	92.5	91.3	91.3	92.2	92.0	92.2	92.8	93.4	92.7	91.3	86.4	93.5	140.9
2000	107.7	108.8	108.8	110.7	109.2	104.8	101.2	100.0	97.8	96.5	95.8	95.9	97.7	96.5	95.7	92.2	104.4	151.8
2500	100.6	101.7	102.1	102.6	101.1	97.1	93.9	93.4	92.4	91.9	91.9	92.5	92.7	92.4	91.4	86.6	97.3	144.7
3150	98.0	98.9	99.4	99.5	97.2	93.5	91.2	91.0	90.5	91.0	91.0	91.8	91.4	91.2	89.4	84.6	94.8	142.2
4000	101.7	103.0	103.1	104.8	102.3	98.5	95.1	93.0	92.6	92.8	94.5	95.4	95.1	94.3	91.8	86.4	99.2	146.6
5000	99.2	99.6	99.6	100.7	98.1	94.6	91.4	89.7	90.7	91.1	92.2	93.2	92.4	93.1	91.7	84.3	96.1	143.5
6300	97.6	98.7	98.3	100.0	97.7	93.7	91.3	89.3	87.9	88.7	88.7	88.7	88.1	88.6	87.6	81.2	95.2	142.6
8000	95.4	97.3	97.4	99.4	96.1	92.3	89.4	87.9	87.9	89.1	88.8	89.2	87.0	89.2	87.3	80.1	94.9	142.3
10000	93.1	94.6	95.1	97.2	93.9	89.9	87.1	85.4	85.8	86.8	86.4	87.0	84.1	87.4	85.8	77.6	93.6	141.0
12500	91.1	91.7	92.3	94.3	91.2	87.4	84.2	82.7	85.1	86.1	86.5	86.0	79.9	85.6	84.6	75.0	92.6	140.0
16000	87.5	88.6	88.5	90.3	87.5	83.5	82.0	81.2	83.0	84.2	85.5	84.3	77.8	83.4	84.1	73.3	91.6	135.0
20000	83.5	85.4	86.7	87.6	84.6	80.6	78.9	78.3	81.7	82.9	82.9	83.1	75.5	82.7	82.9	72.1	92.1	139.5
OVERALL	111.2	112.2	112.4	113.8	112.0	108.3	106.0	105.6	105.4	105.7	106.1	106.9	107.9	108.7	108.8	105.5	109.5	156.9
DISTANCE																		
SIDELINE PERCEIVED NOISE LEVELS																		
61 METERS	99.2	108.4	112.6	116.5	116.7	114.4	112.6	112.4	111.7	111.4	111.3	111.3	110.5	108.7	105.4	97.3		
305 METERS	71.8	86.2	92.5	97.4	98.4	96.5	95.2	95.2	94.5	94.1	93.6	93.2	92.8	90.5	86.5	77.1		

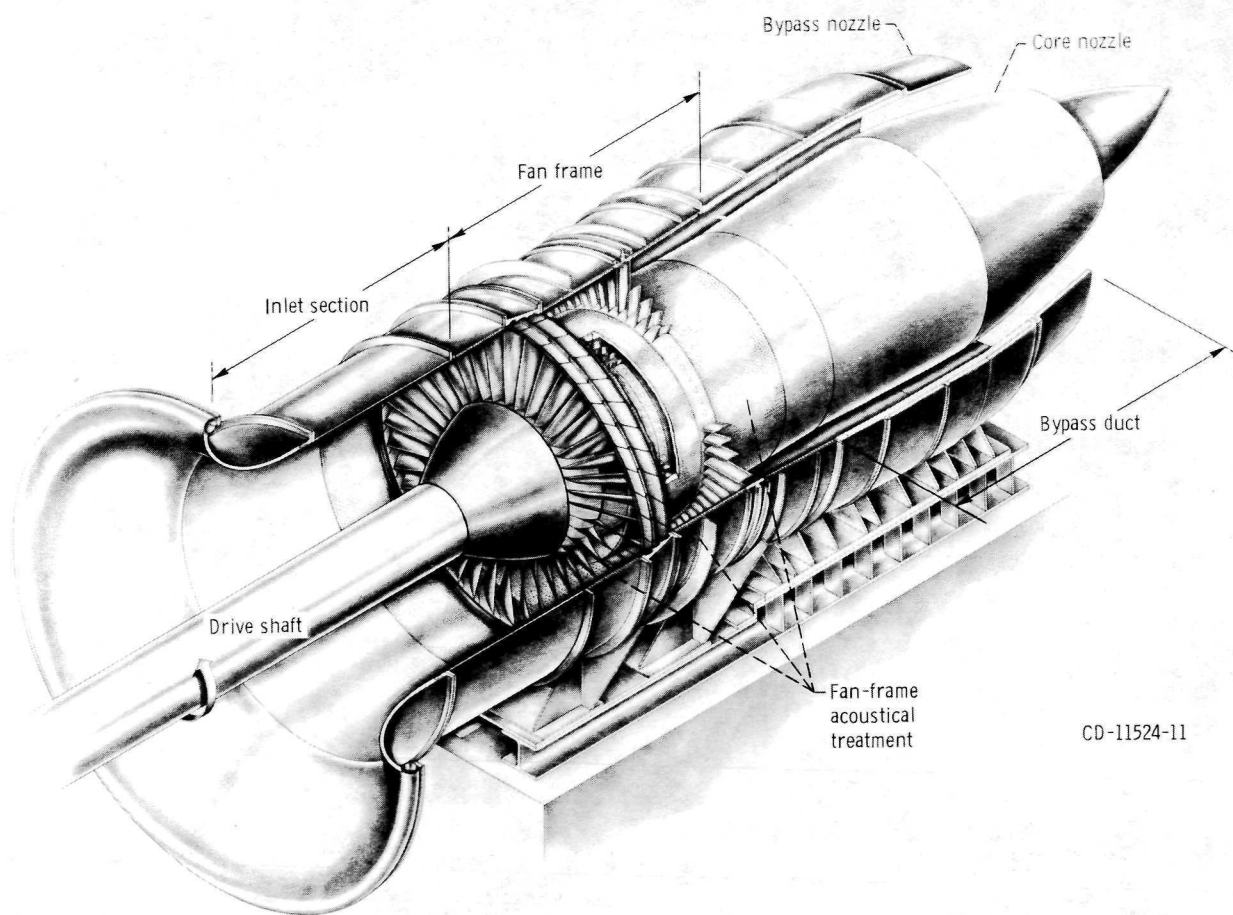
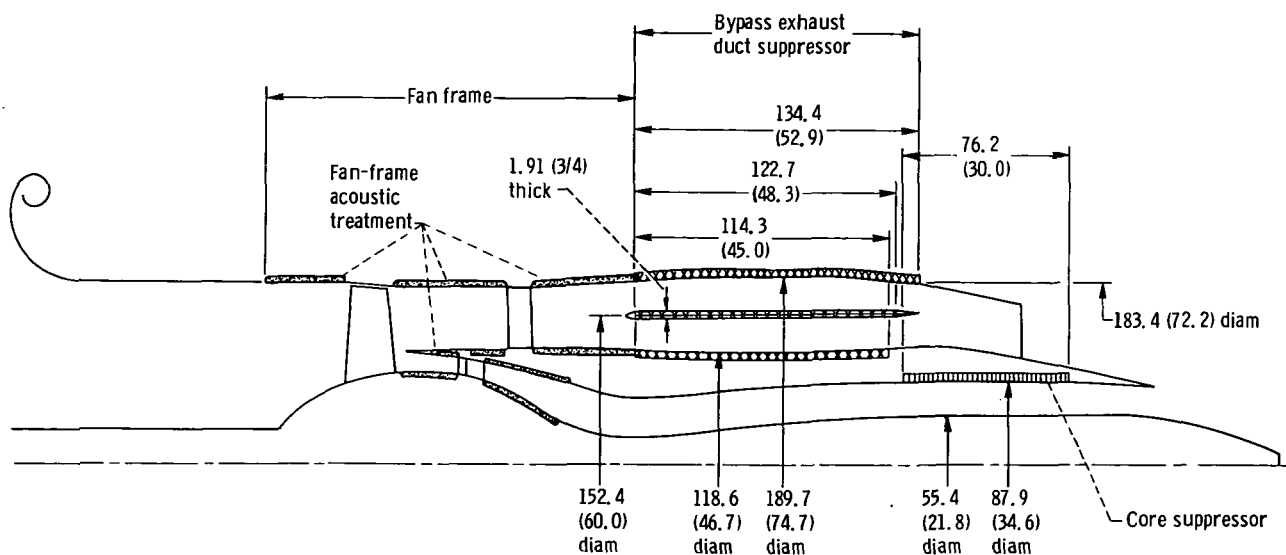


Figure 1. - Cutaway view of fan assembly.



Acoustic treatment specification	Bypass-exhaust-duct suppressor		Core suppressor
	Walls	Splitter	
Facing sheet thickness, cm (in.)	0.051 (0.020)	0.051 (0.020)	0.076 (0.030)
Hole diameter, cm (in.)	0.127 (0.050)	0.127 (0.050)	0.318 (0.125)
Open area, percent	8	4.5	23
Hexagonal cell honeycomb thickness (nominal), cm (in.)	0.95 (3/8)	0.95 (3/8)	-----
Material	-----	-----	Scottfelt SF3-900
Backing depth, cm (in.)	-----	-----	5.08 (2.00)

Figure 2. - Arrangement of flow passages and sound-absorbing surfaces. (Dimensions are in cm (in.)).

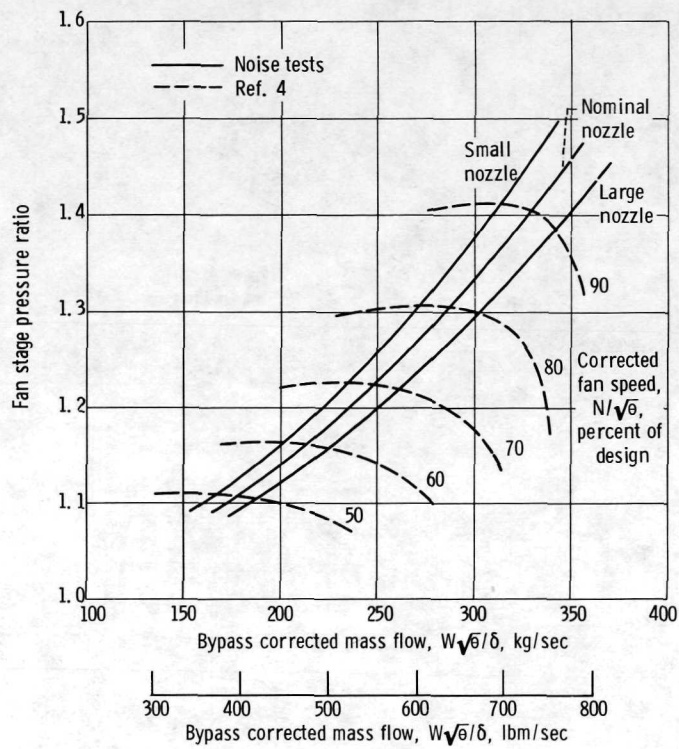


Figure 3. - Fan A performance map for acoustical tests.

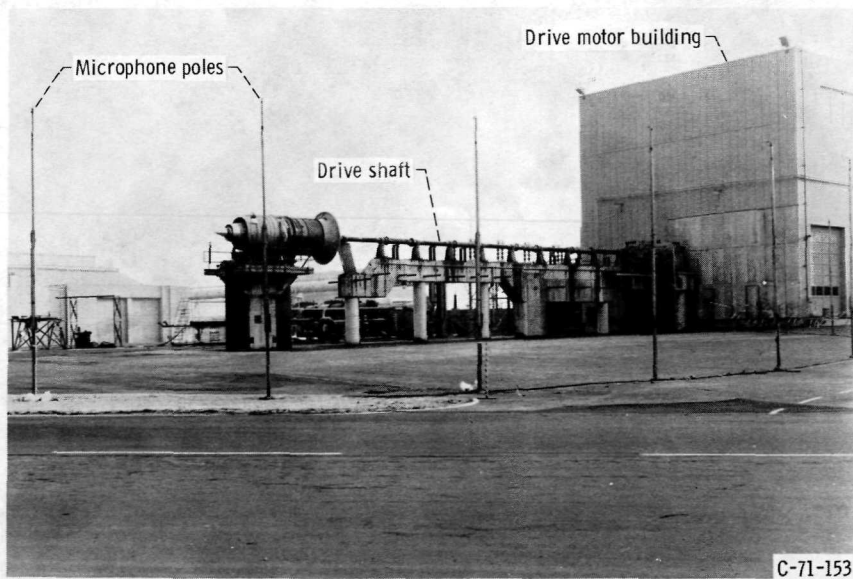


Figure 4. - Full-scale-fan acoustic test facility.

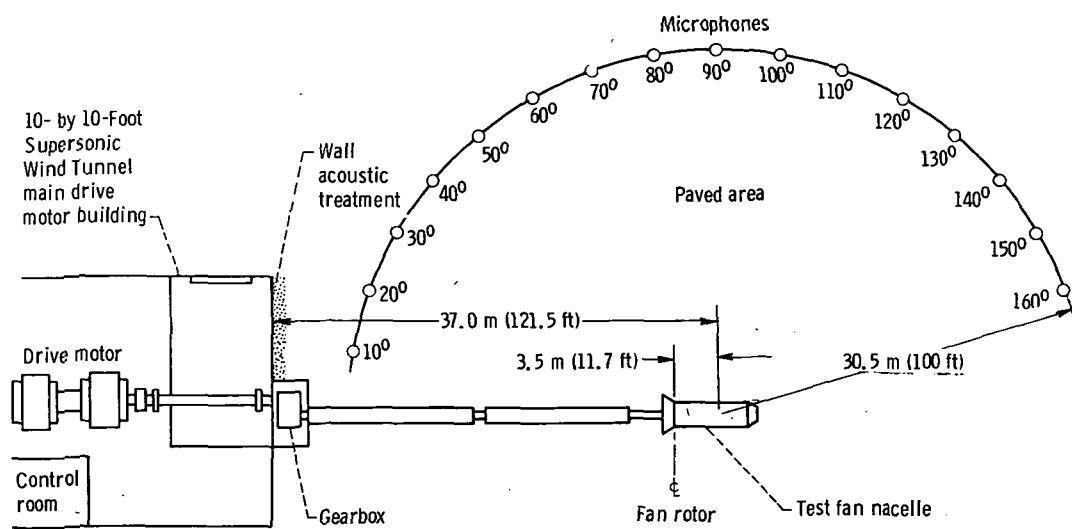
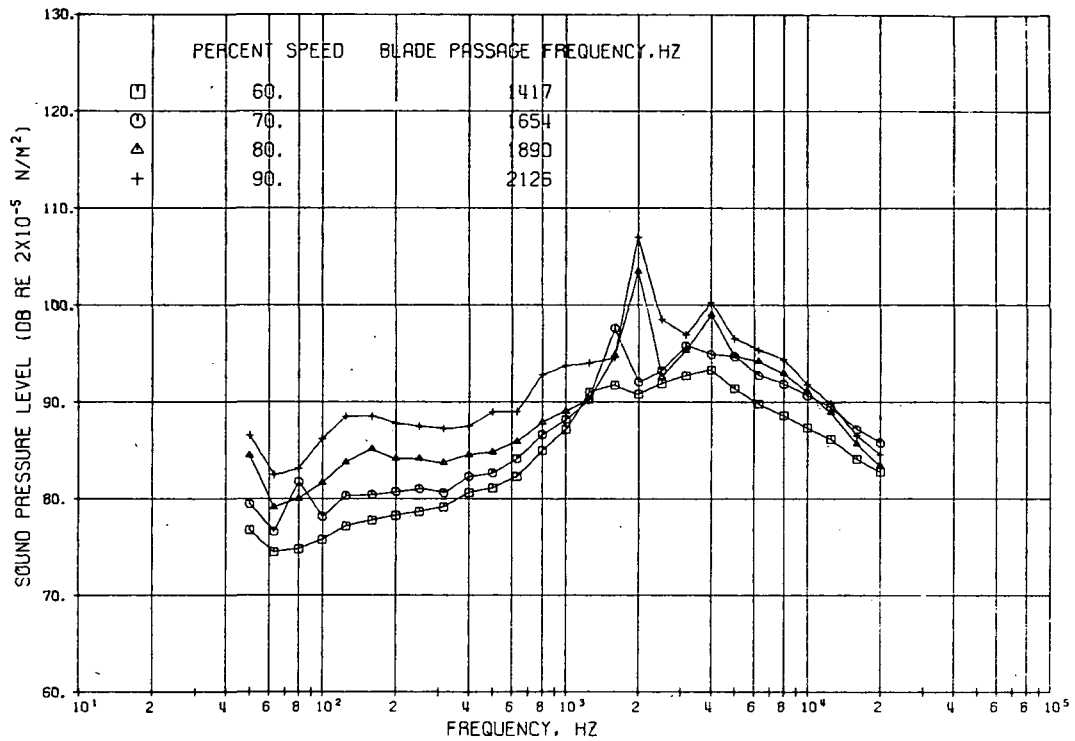
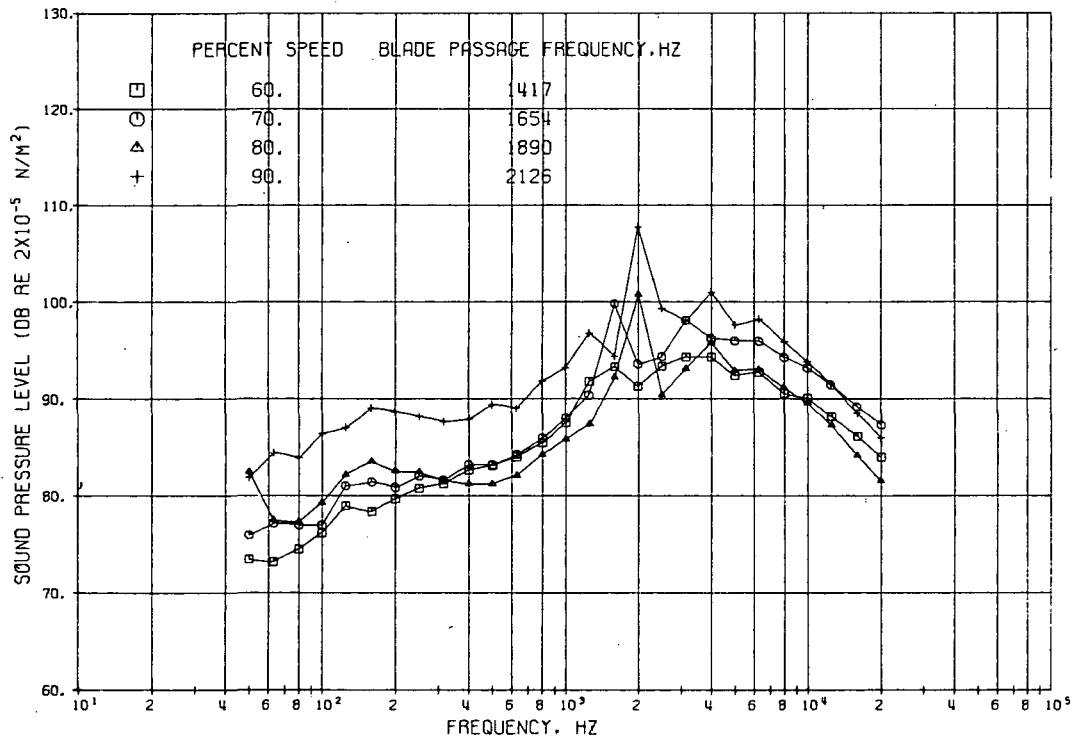


Figure 5. - Plan view of full-scale-fan acoustic test facility.

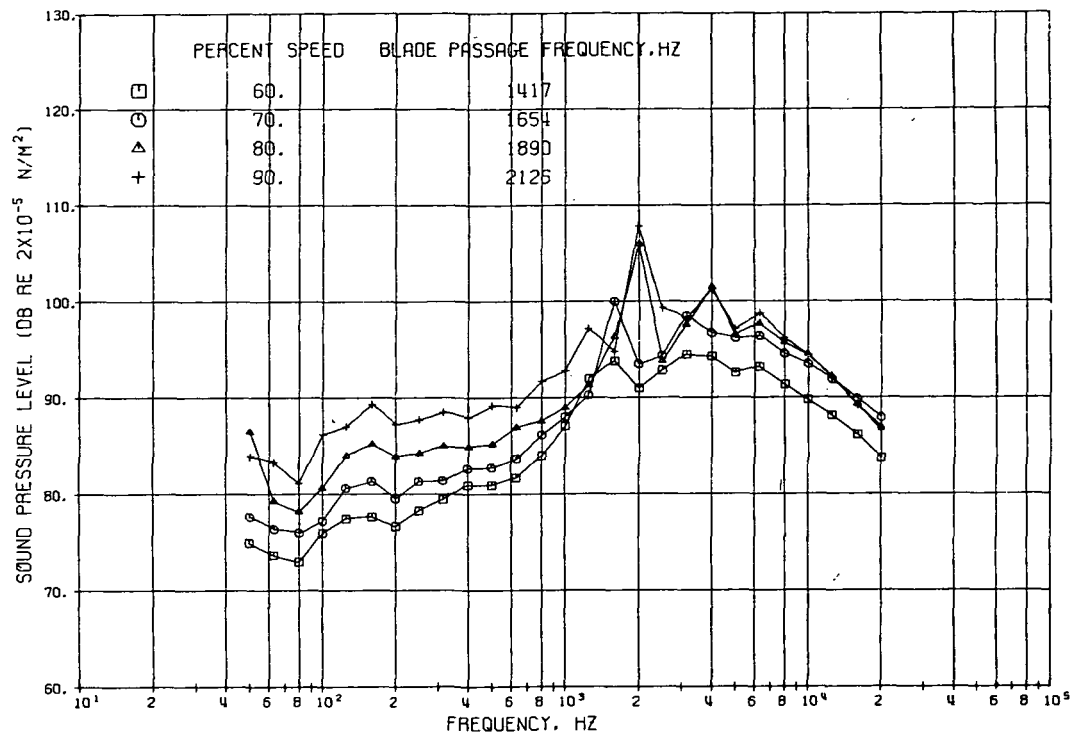


(a) 10°.

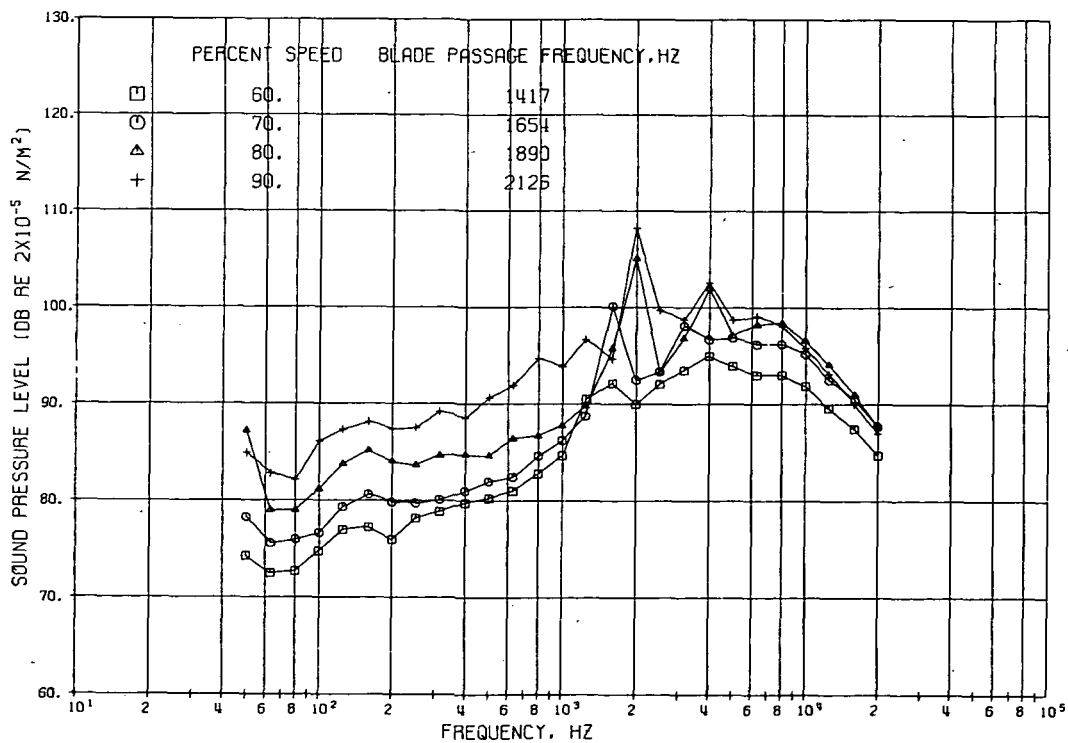


(b) 20°.

Figure 6. - Standard-day 1/3-octave band spectra on 30.5-meter (100-ft) radius at each angle. Configuration 206: hard inlet, soft fan frame, hard exhaust, and nominal nozzle.

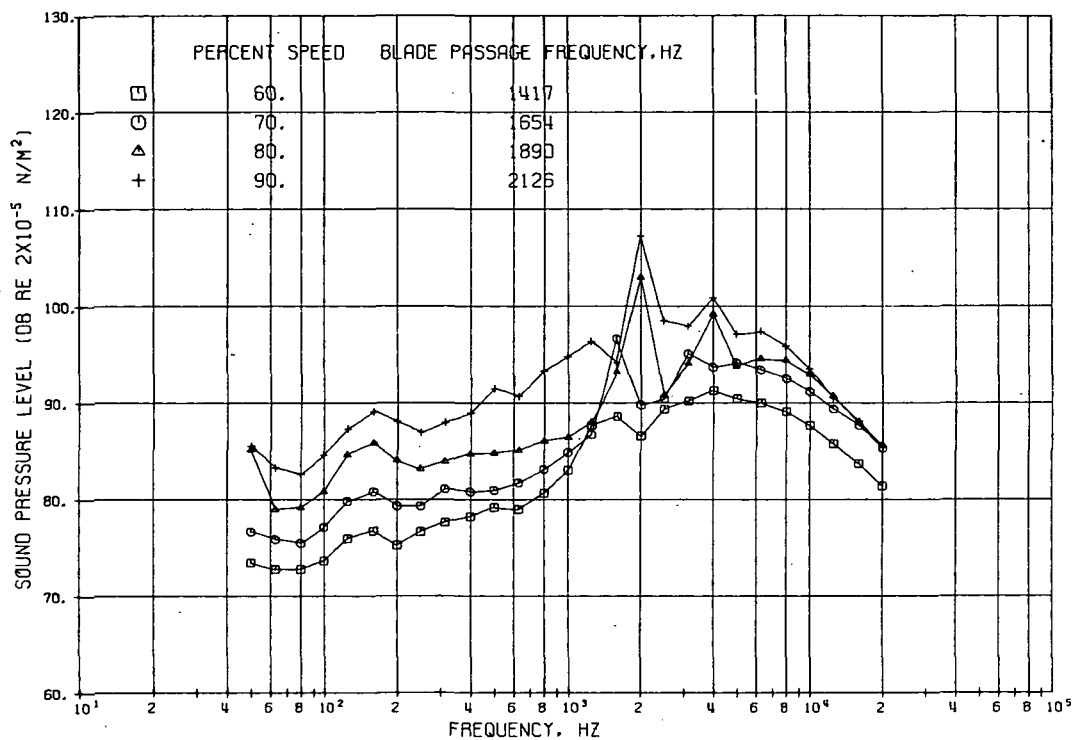


(c) 30°.

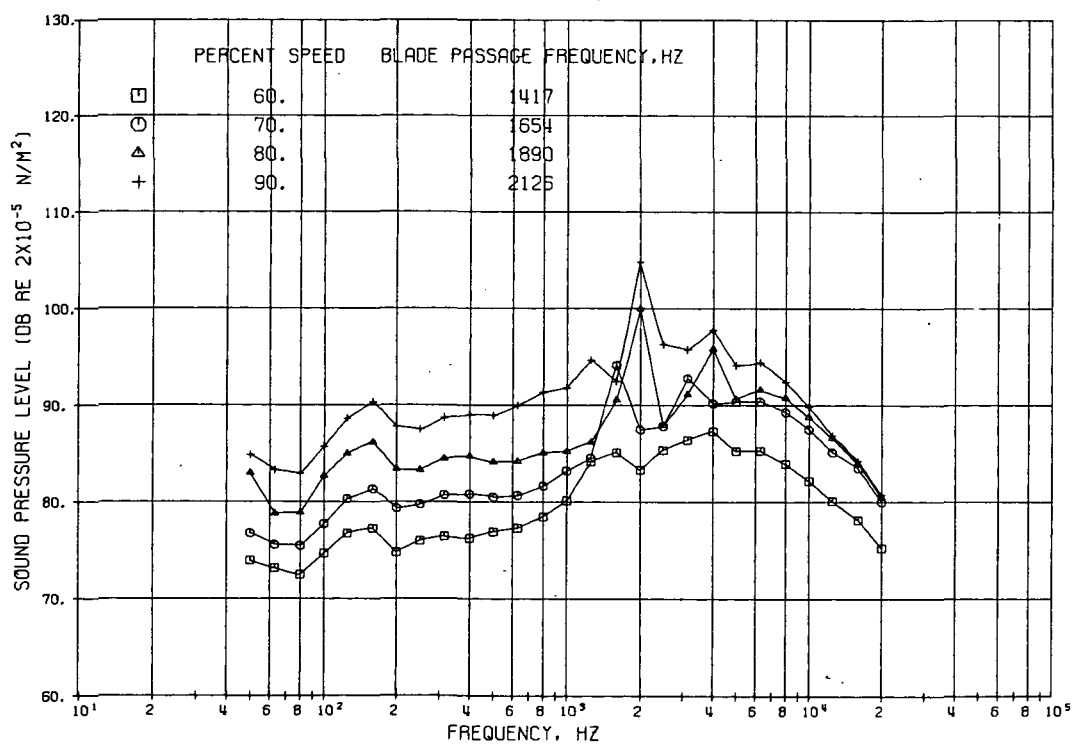


(d) 40°.

Figure 6. - Continued.



(e) 50°.



(f) 60°.

Figure 6. - Continued.

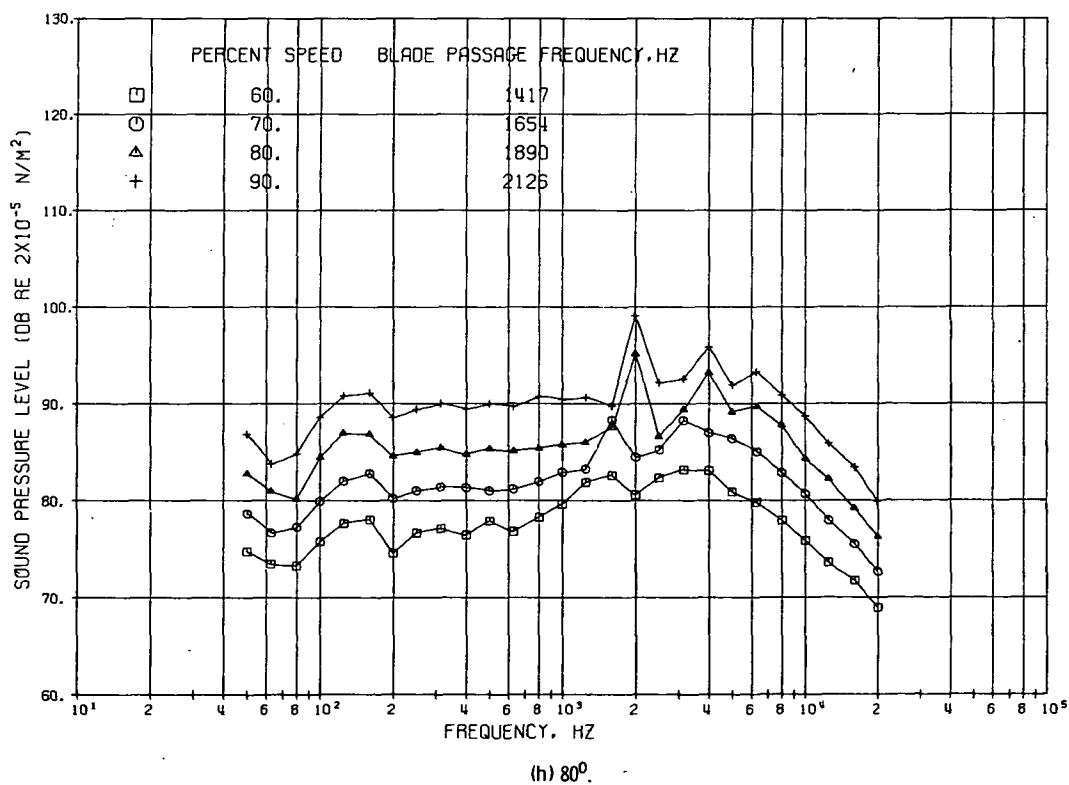
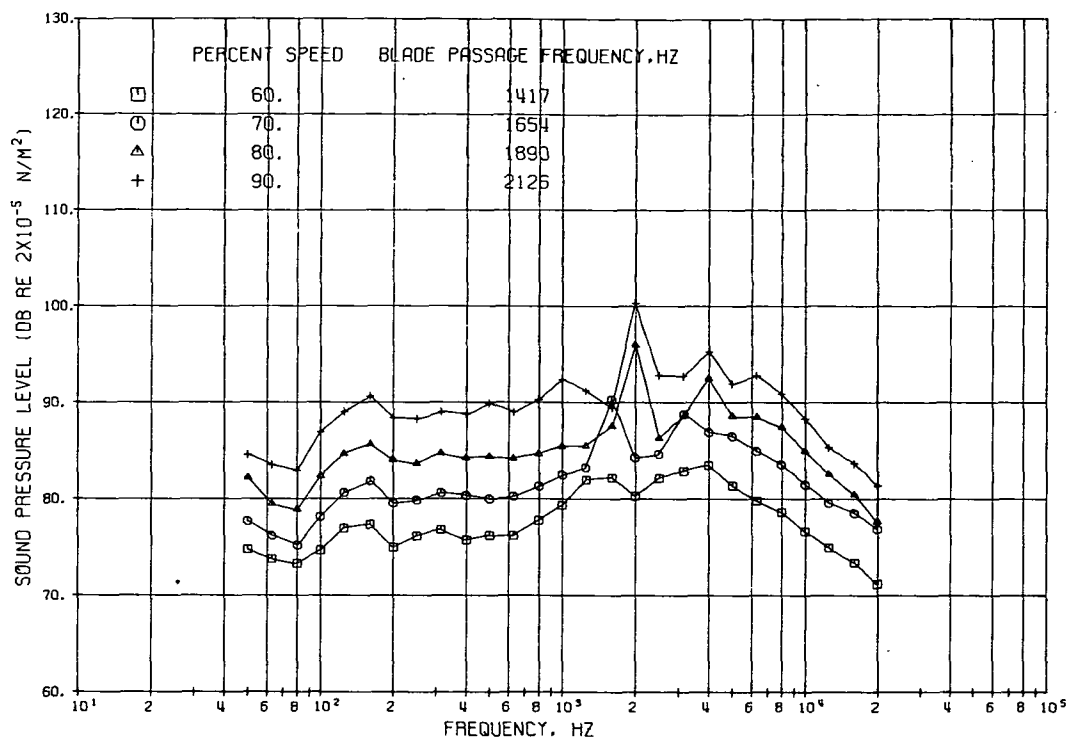
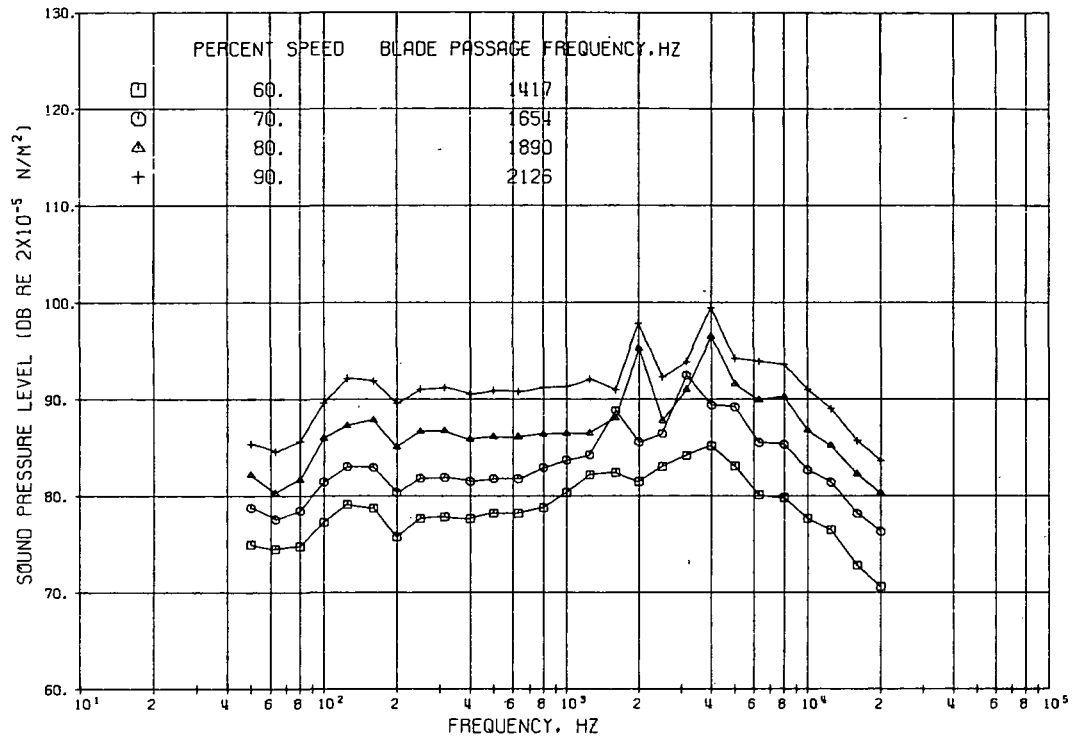
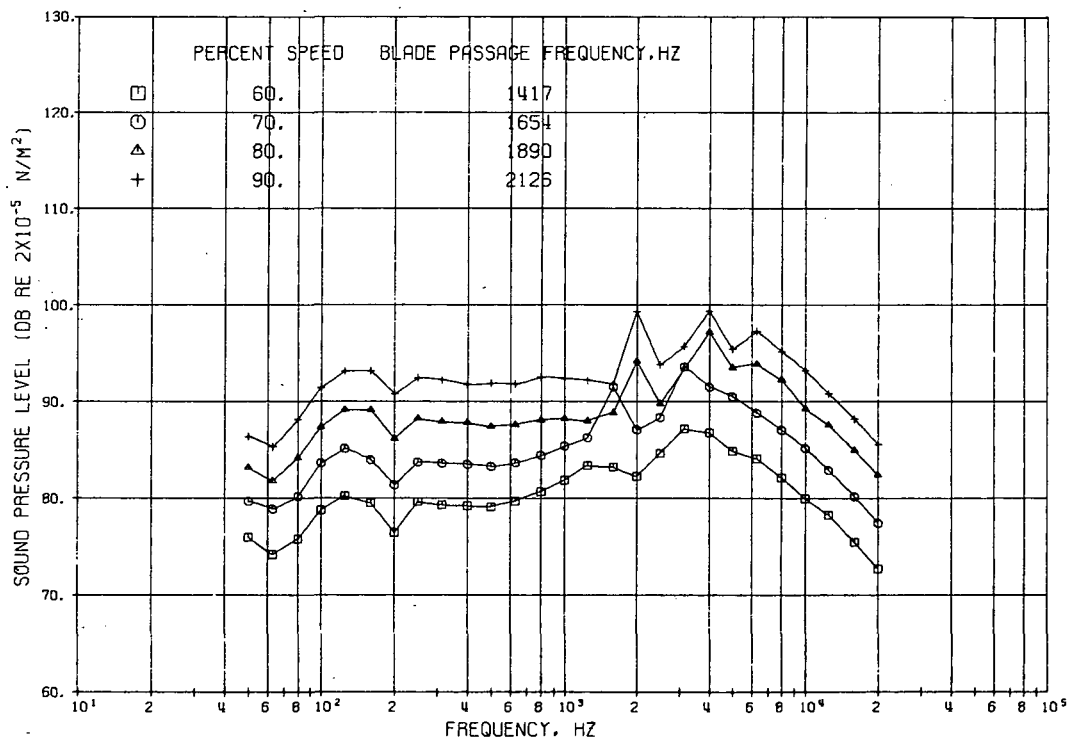


Figure 6. - Continued.

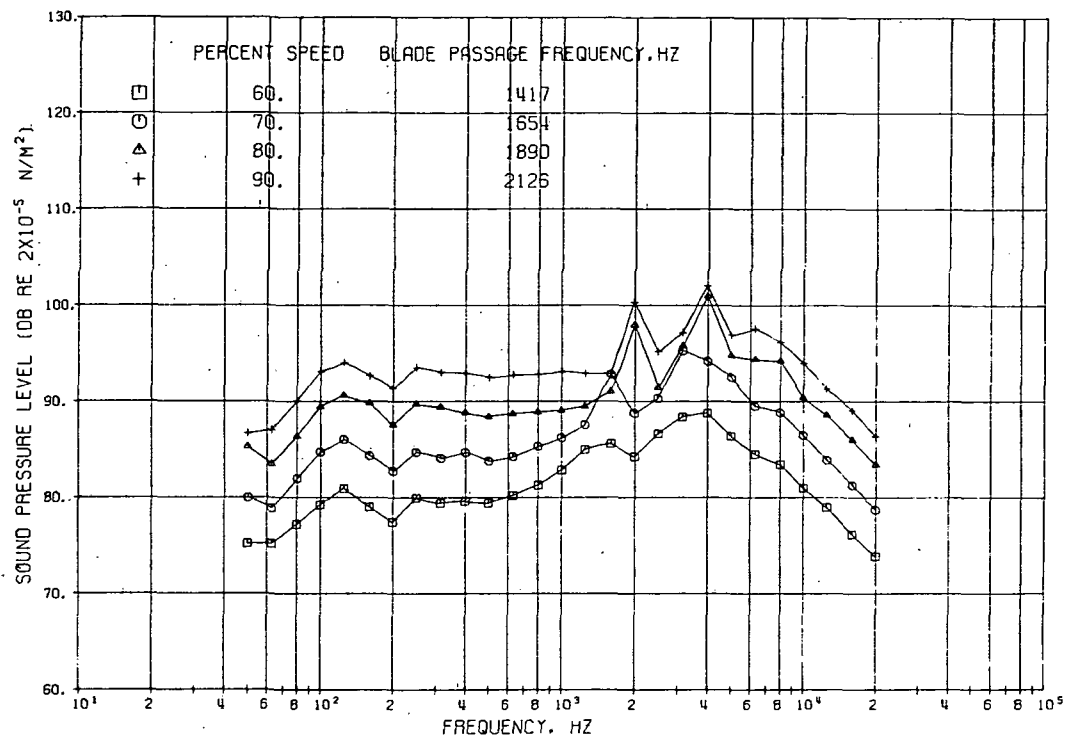


(i) 90°.

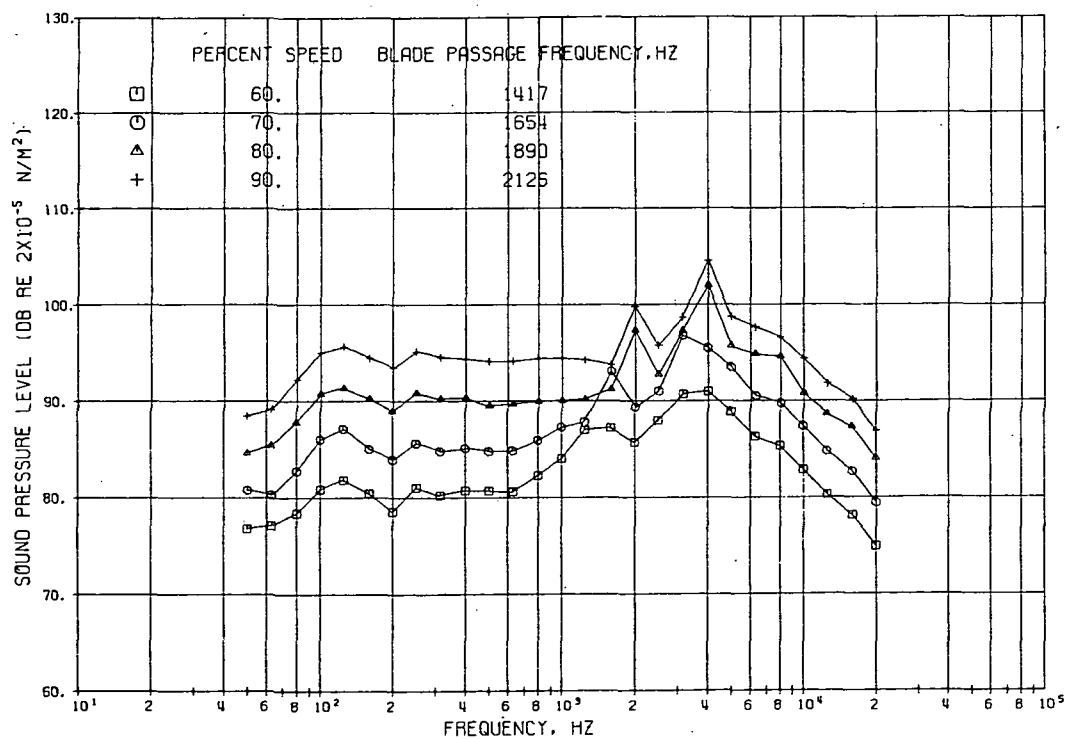


(j) 100°.

Figure 6. - Continued.



(k) 110°.



(l) 120°.

Figure 6. - Continued.

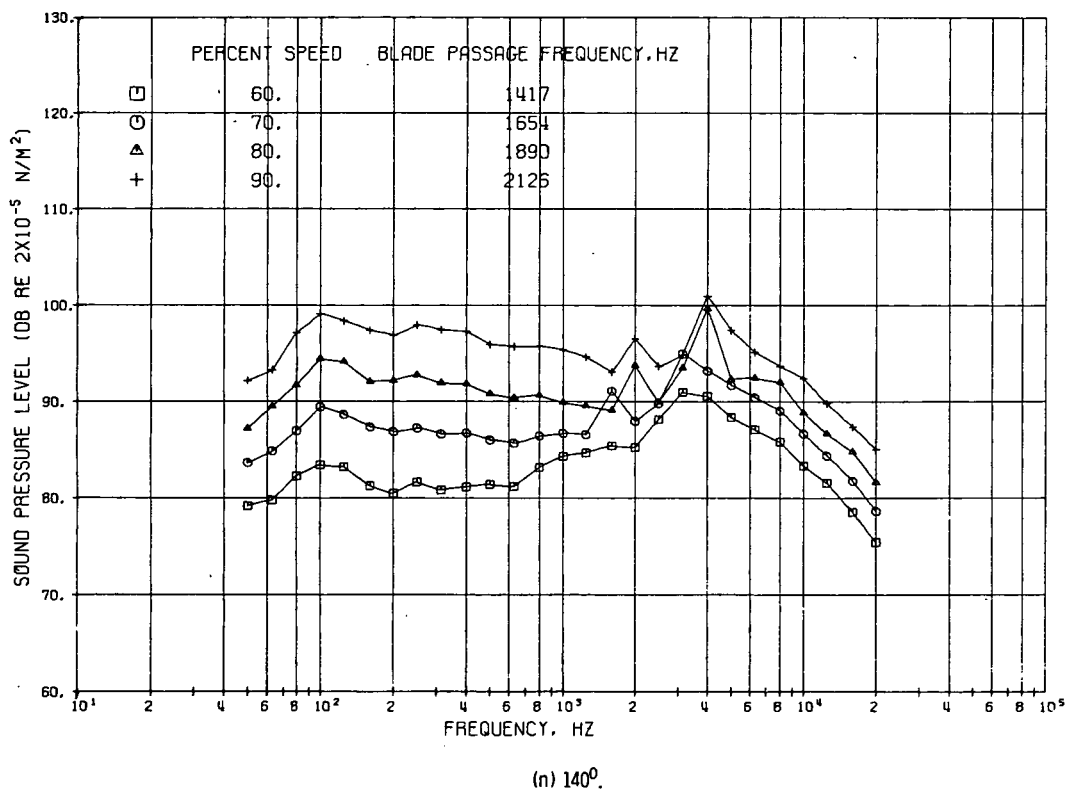
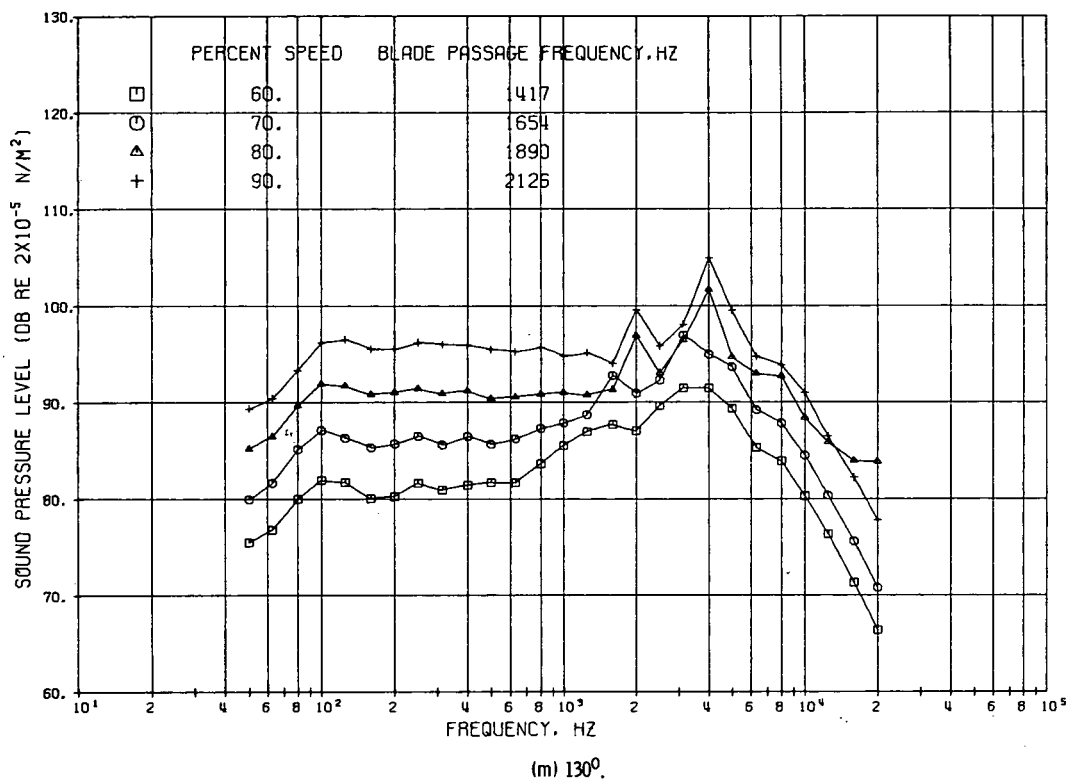
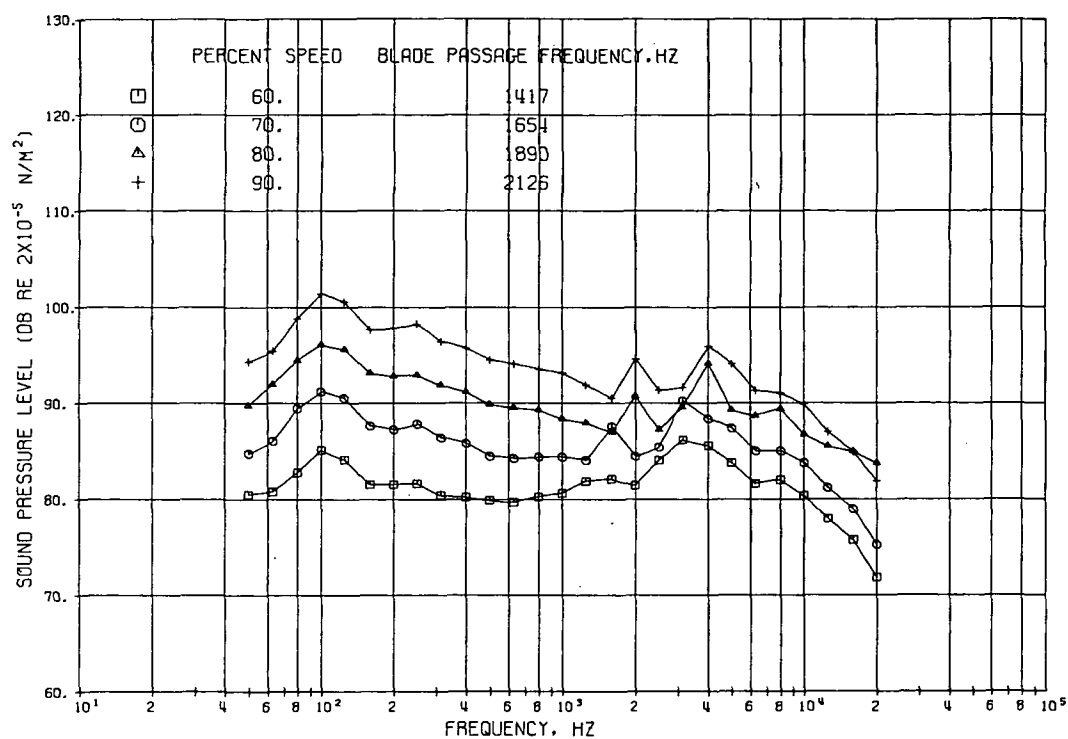
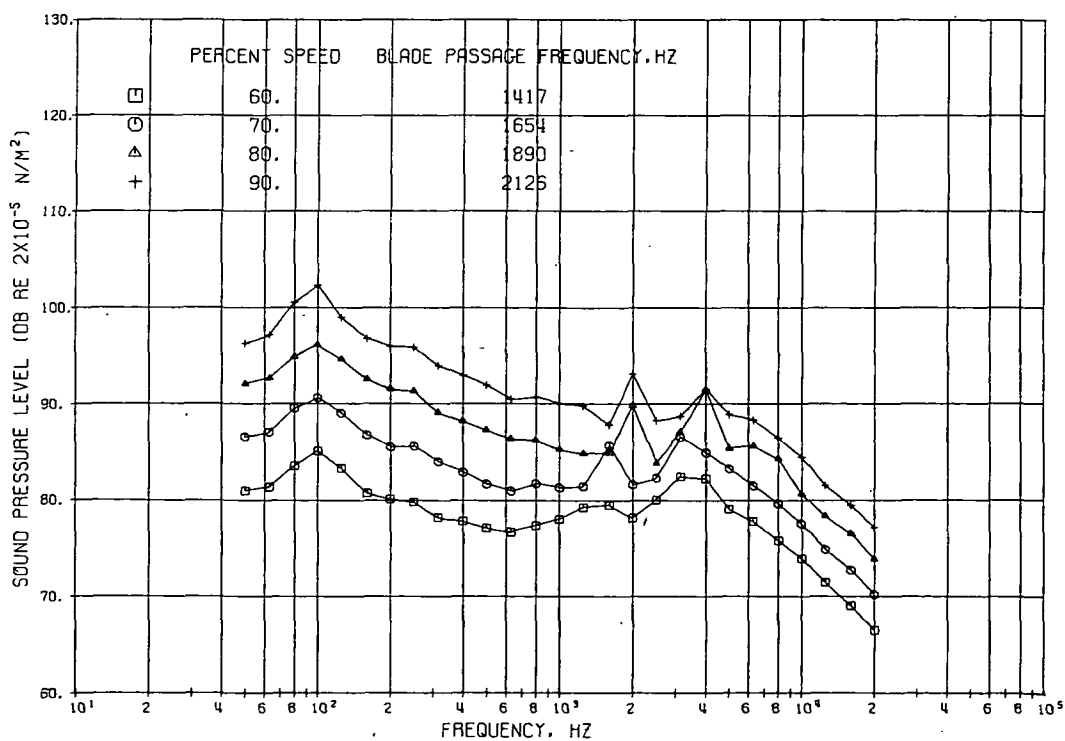


Figure 6. - Continued.



(a) 150°.



(p) 160°.

Figure 6. - Concluded.

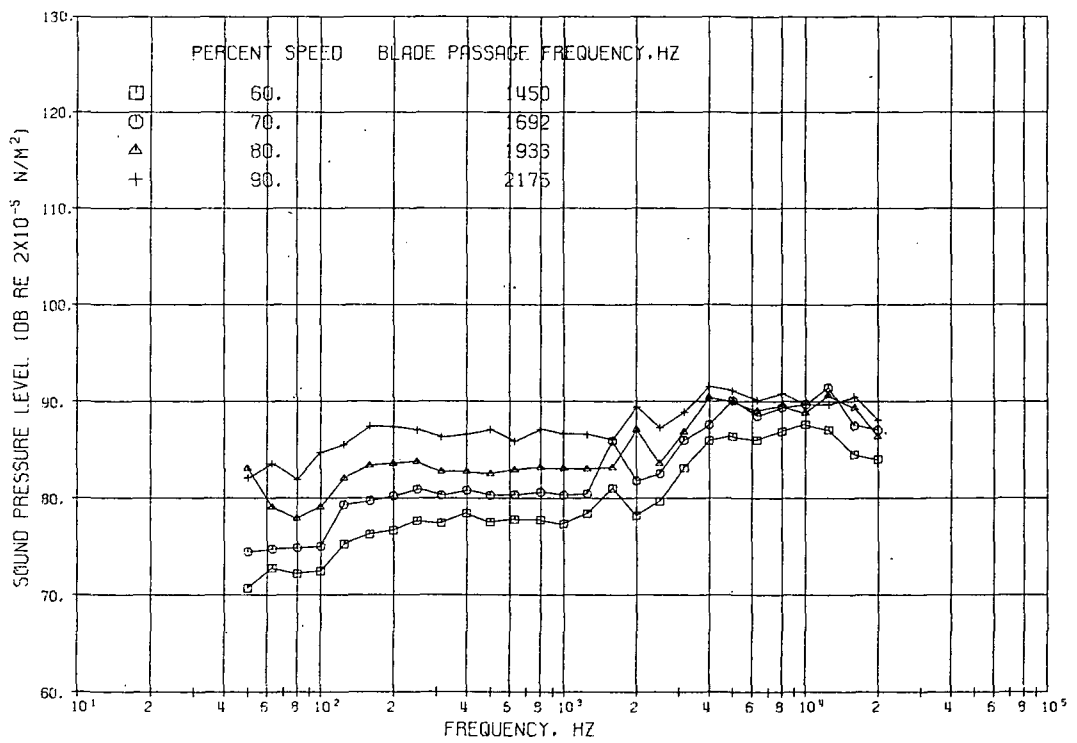
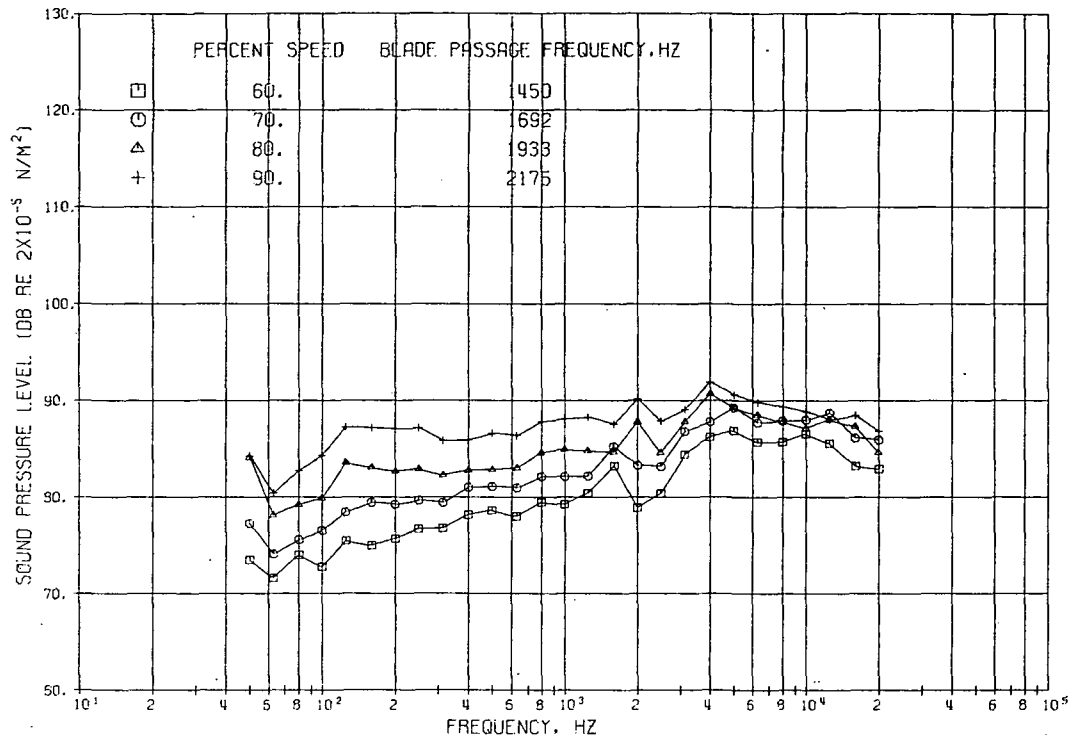


Figure 7. - Standard-day 1/3-octave band spectra on 30.5-meter (100-ft) radius at each angle. Configuration 208: inlet suppressor, soft fan frame, exhaust suppressor, and nominal nozzle.

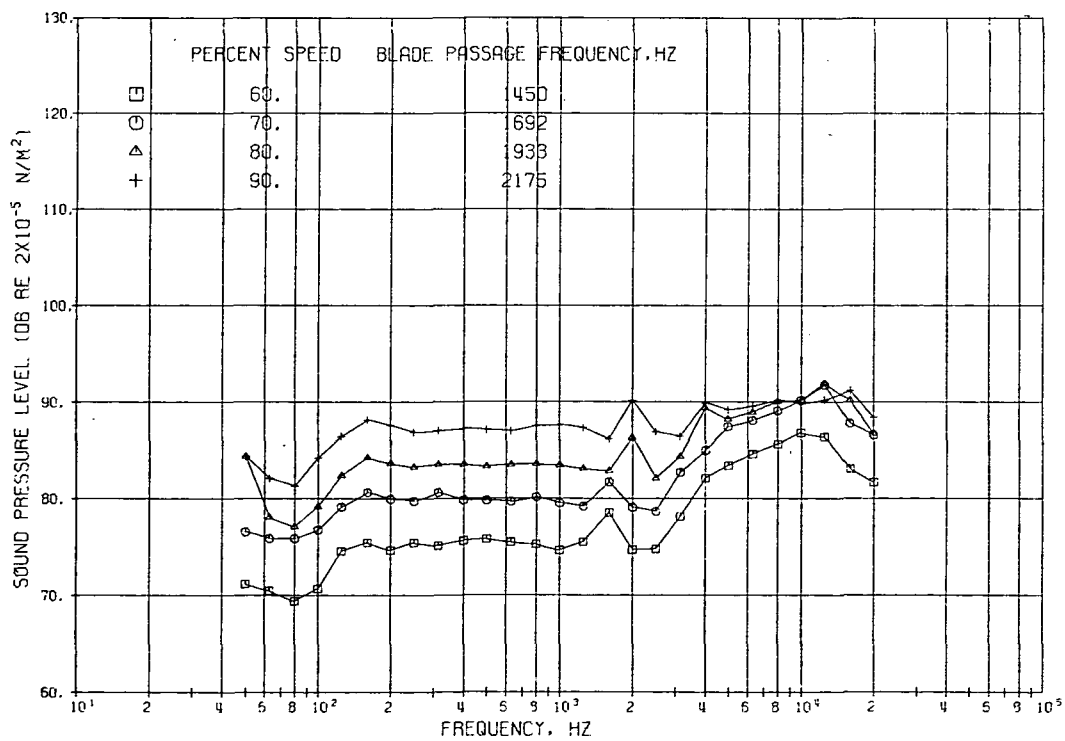
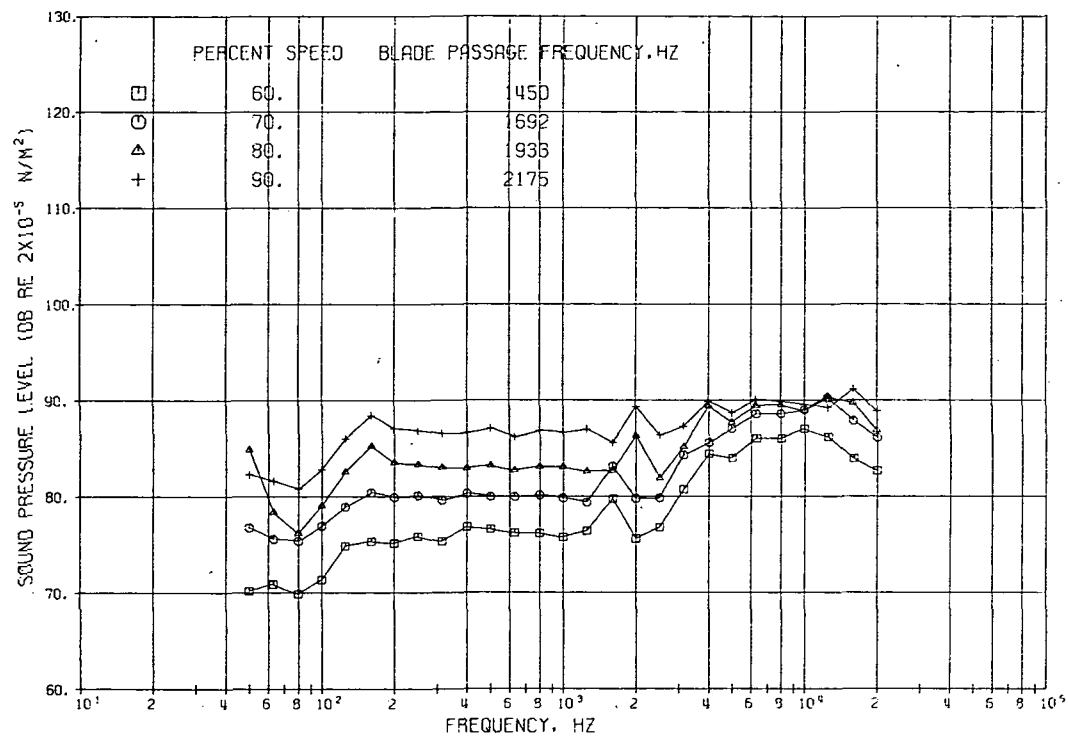
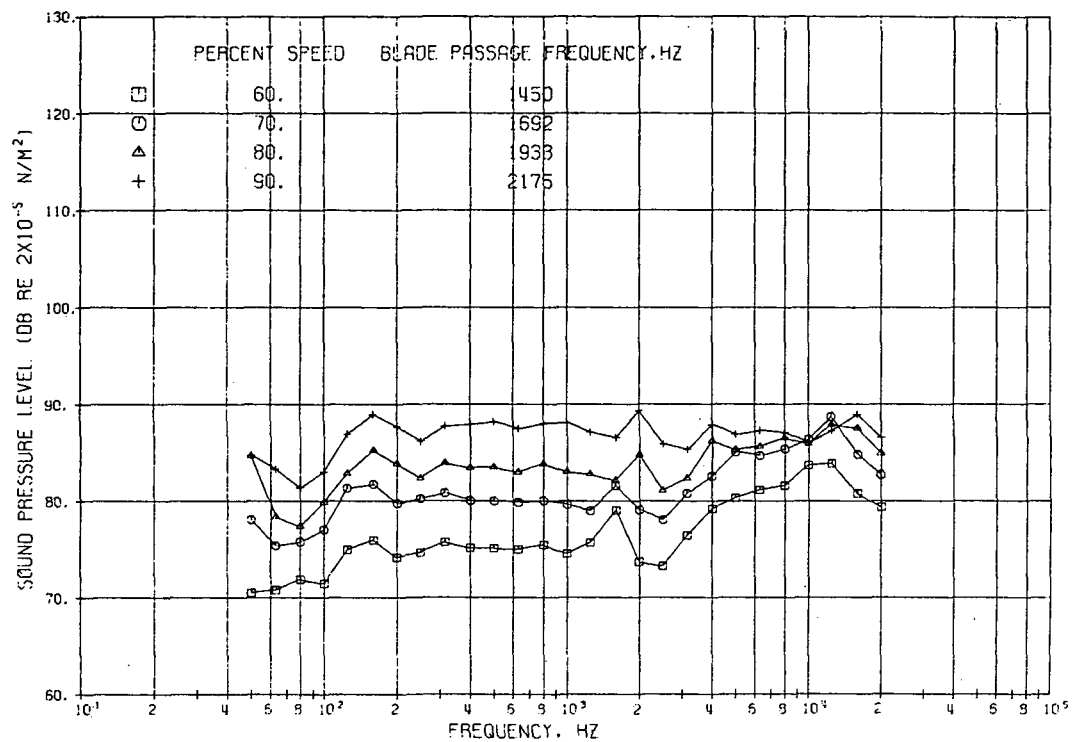
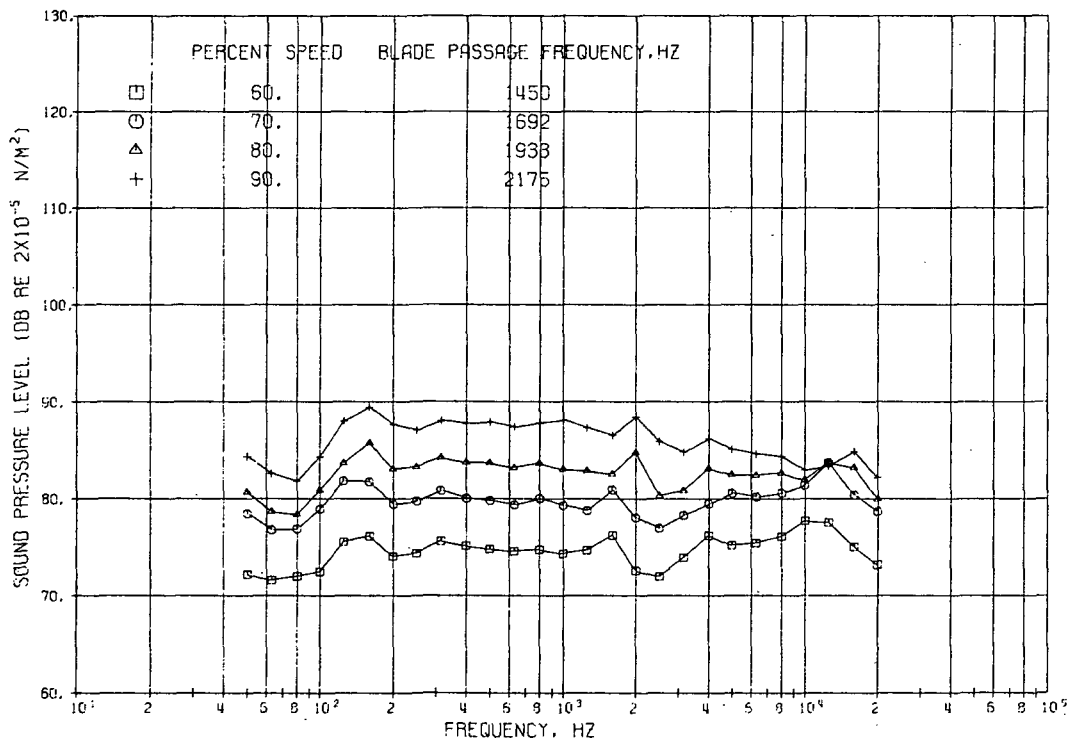


Figure 7. - Continued.

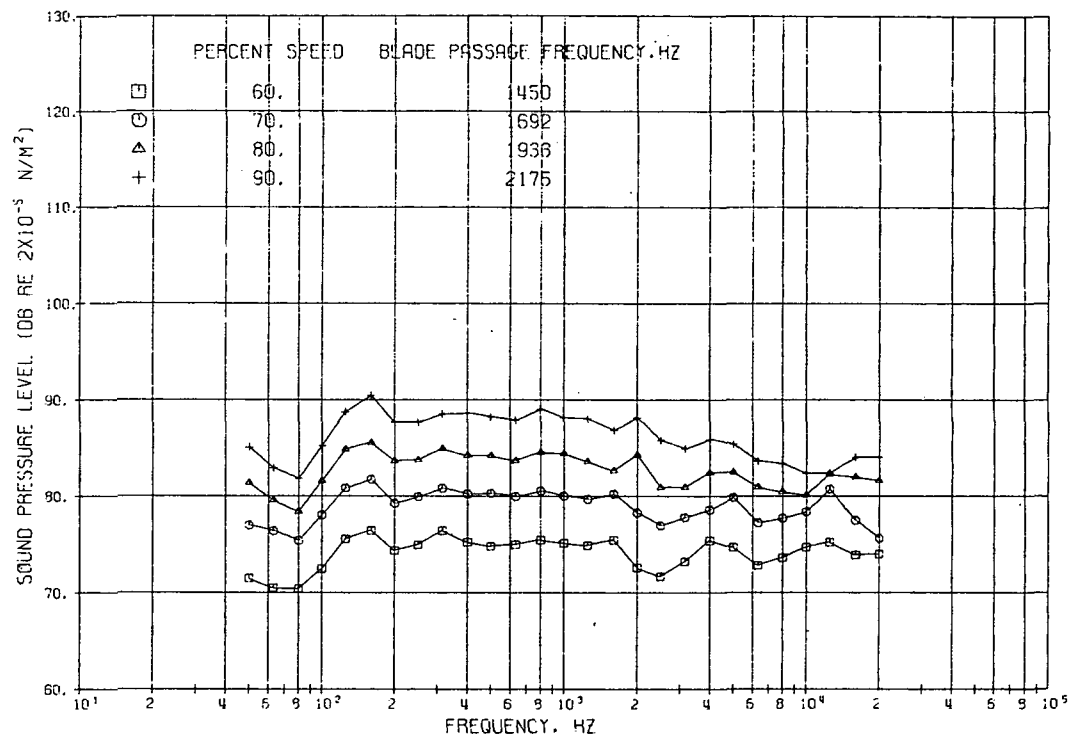


(e) 50°.

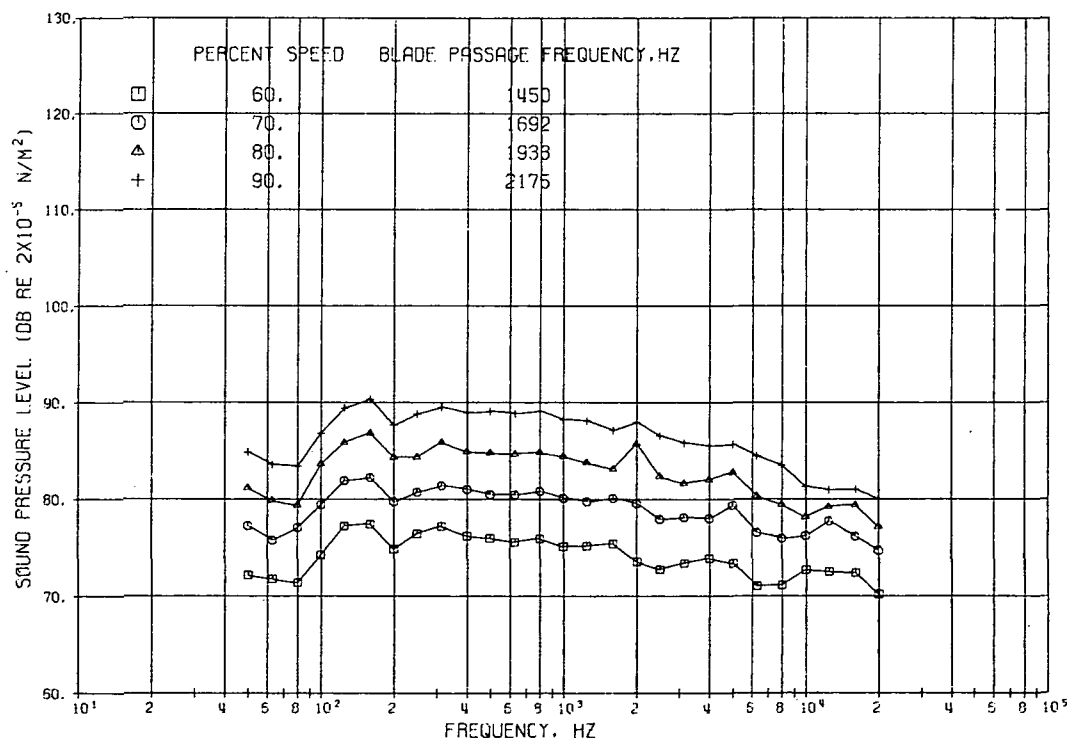


(f) 60°.

Figure 7. - Continued.

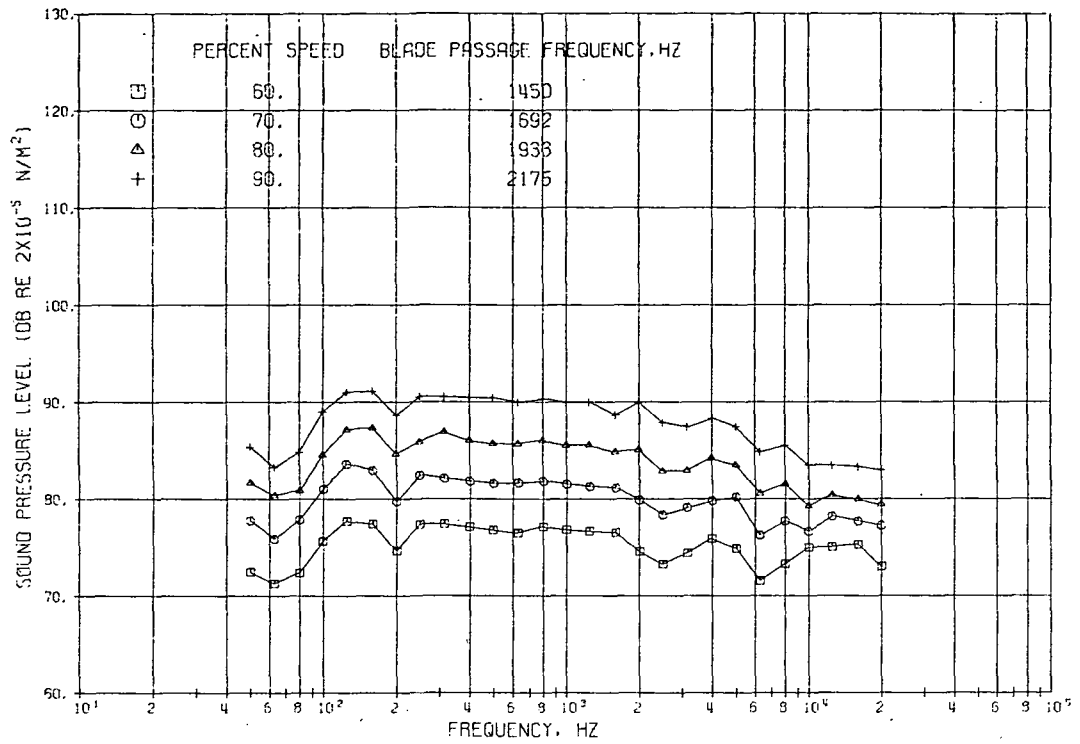


(g) 70°.

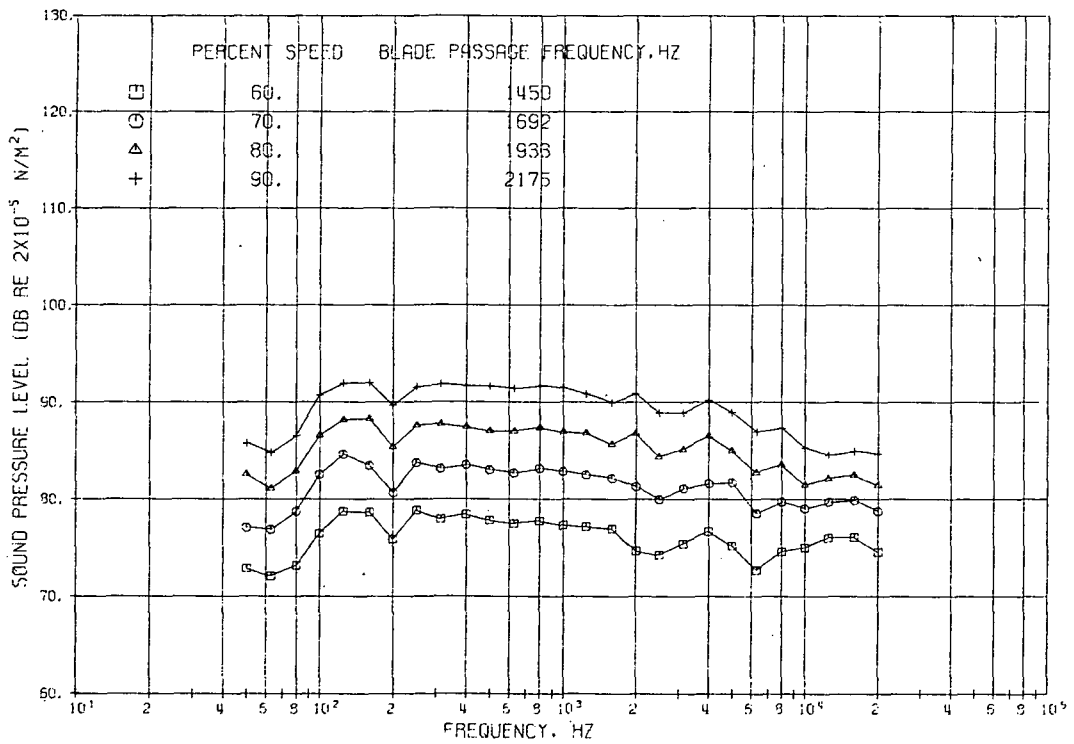


(h) 80°.

Figure 7. - Continued.



(i) 90°.



(j) 100°.

Figure 7. - Continued.

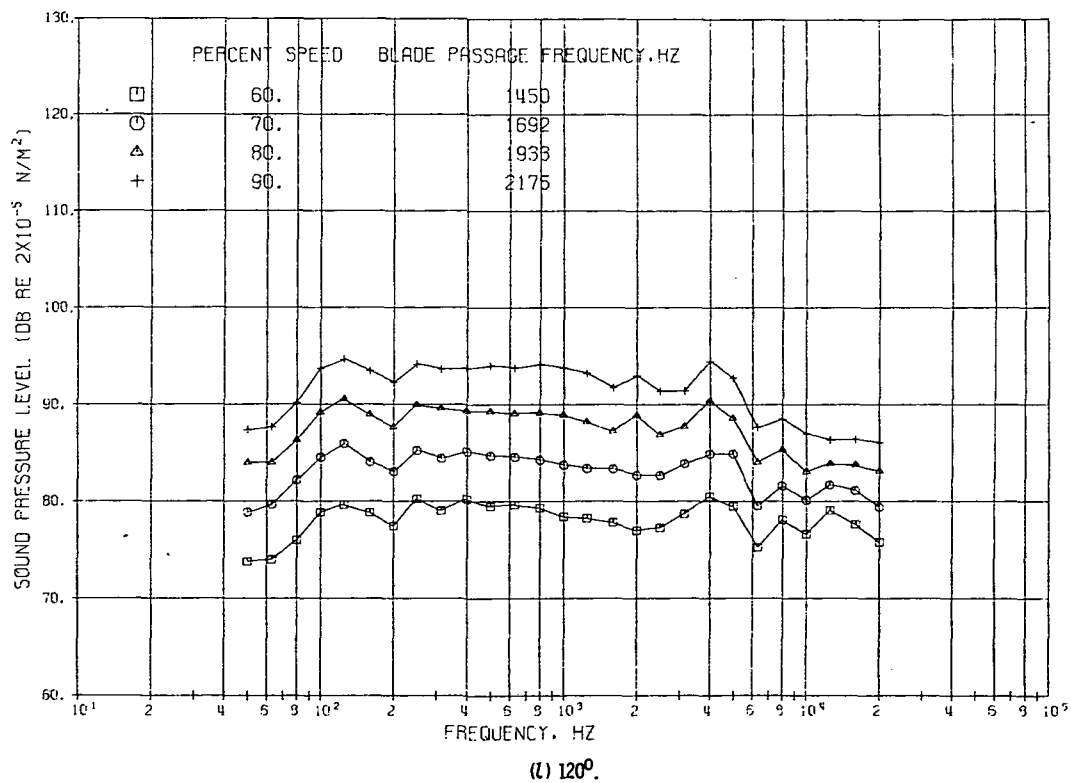
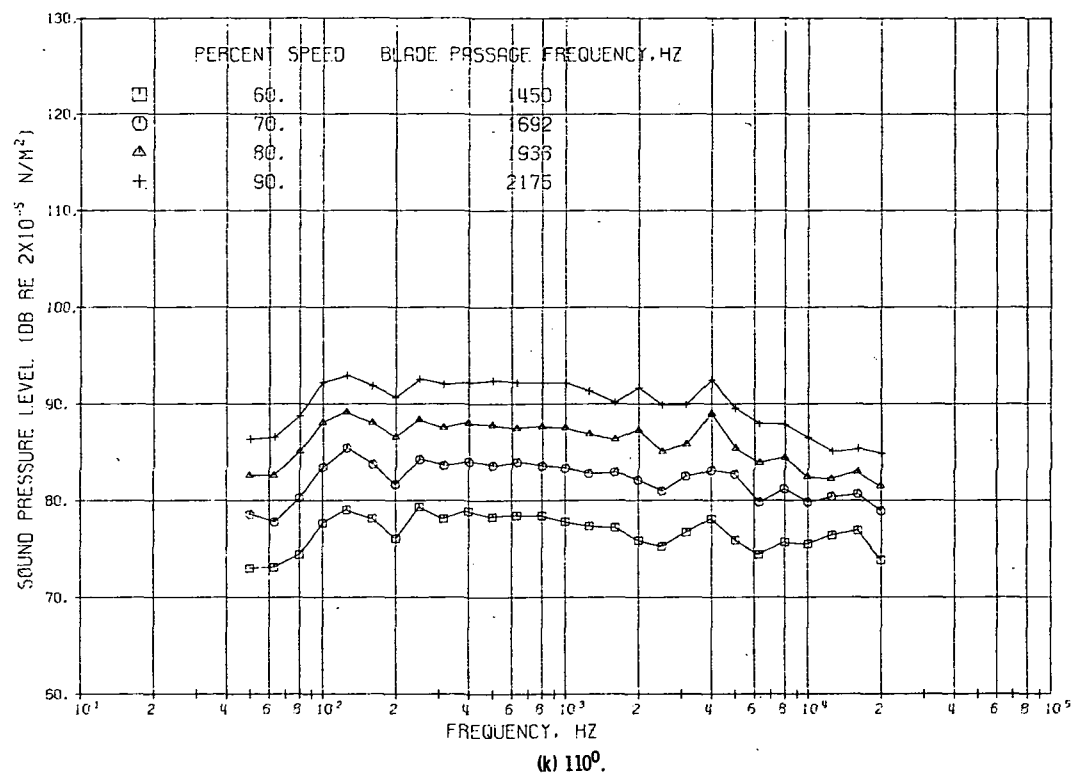


Figure 7. - Continued.

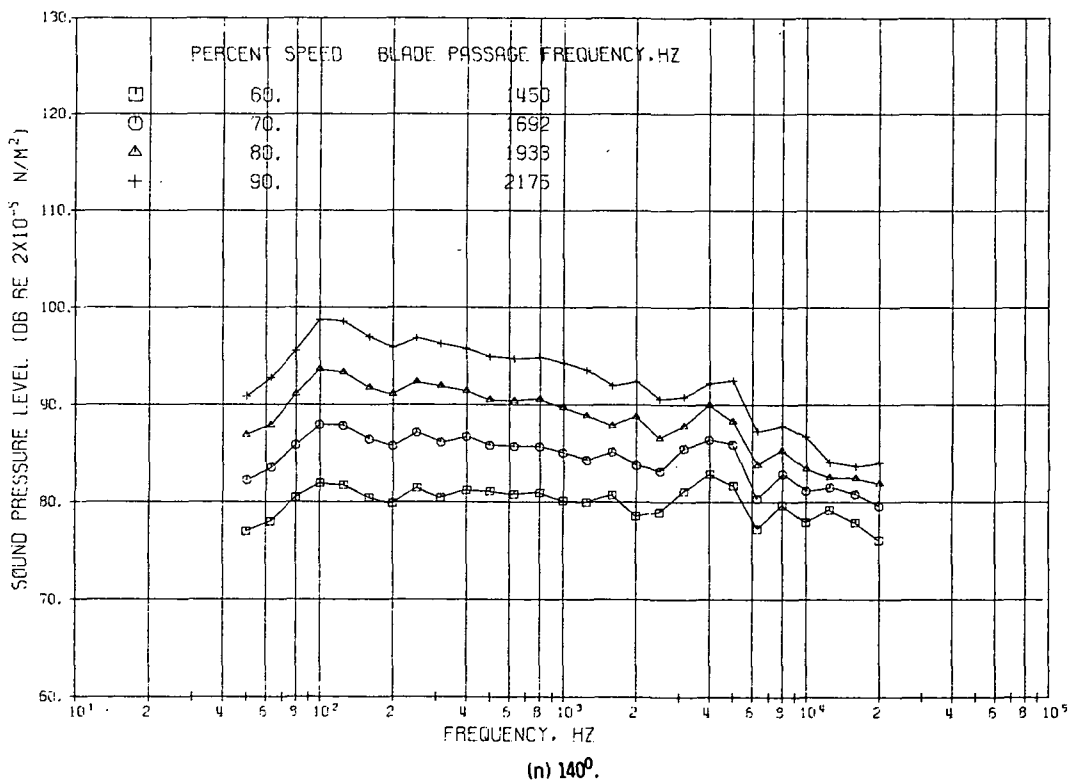
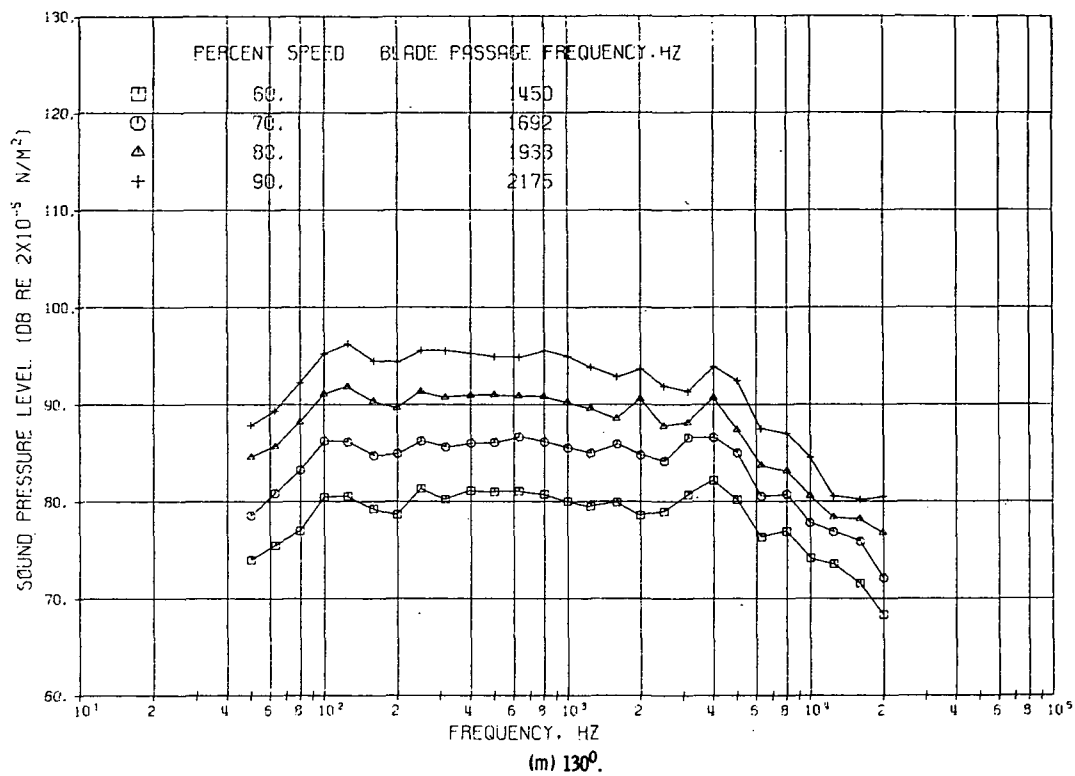


Figure 7. - Continued.

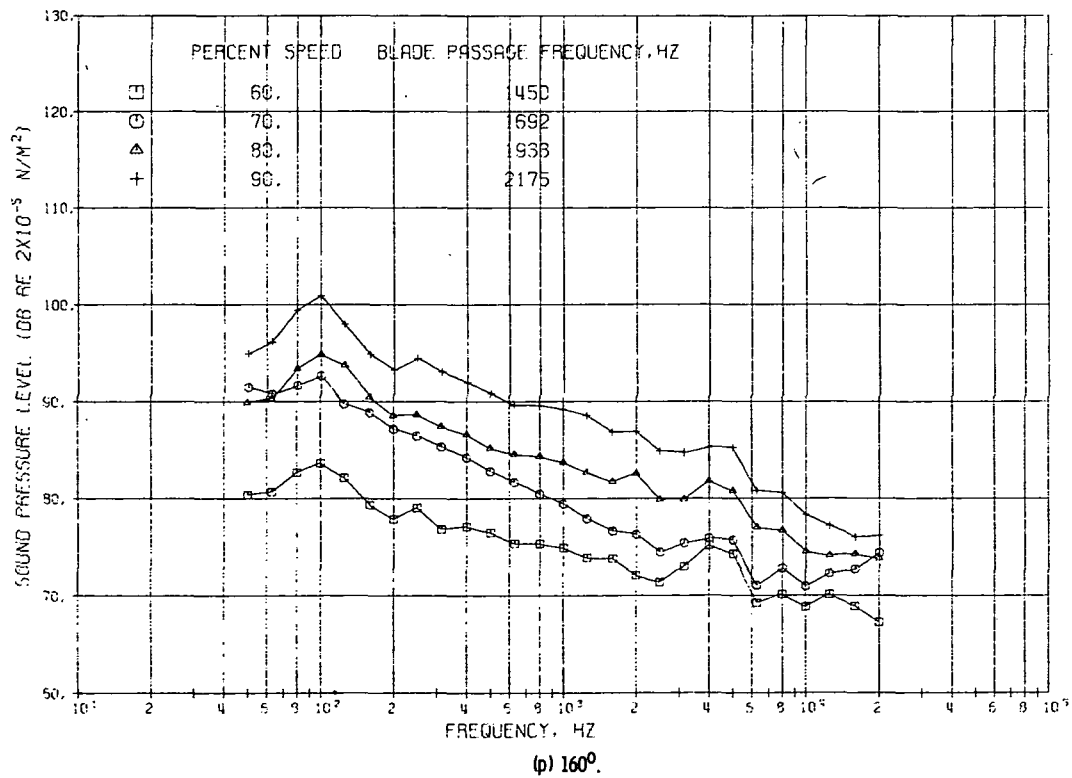
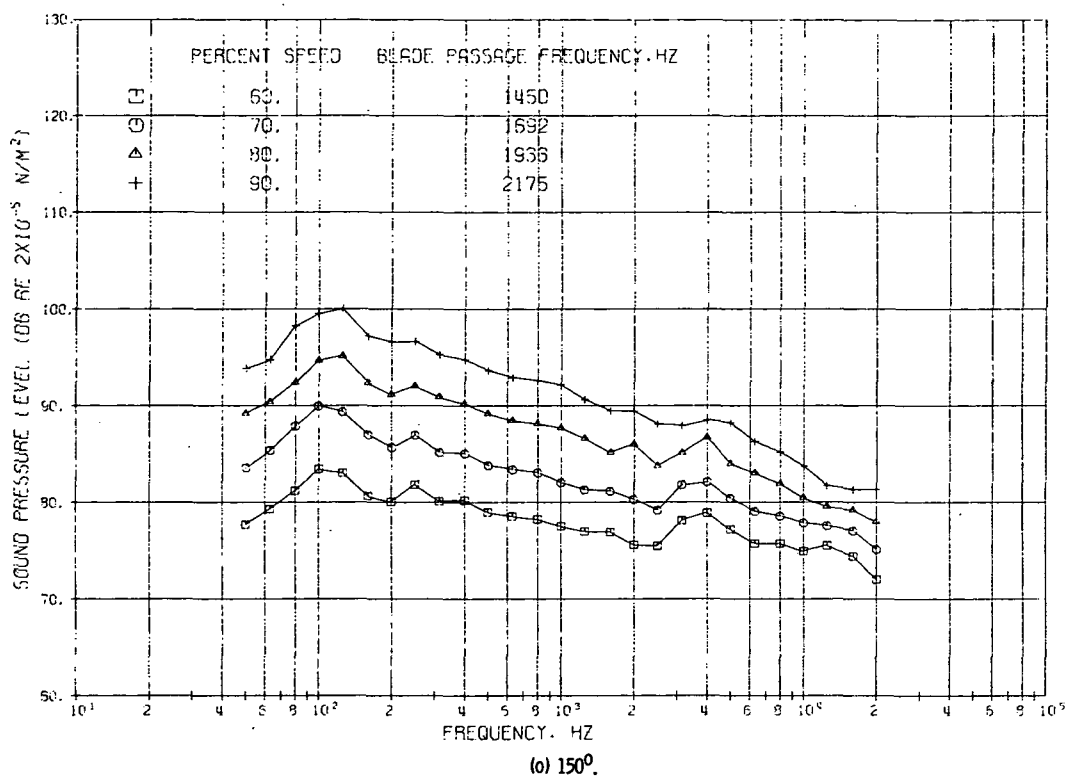


Figure 7. - Concluded.

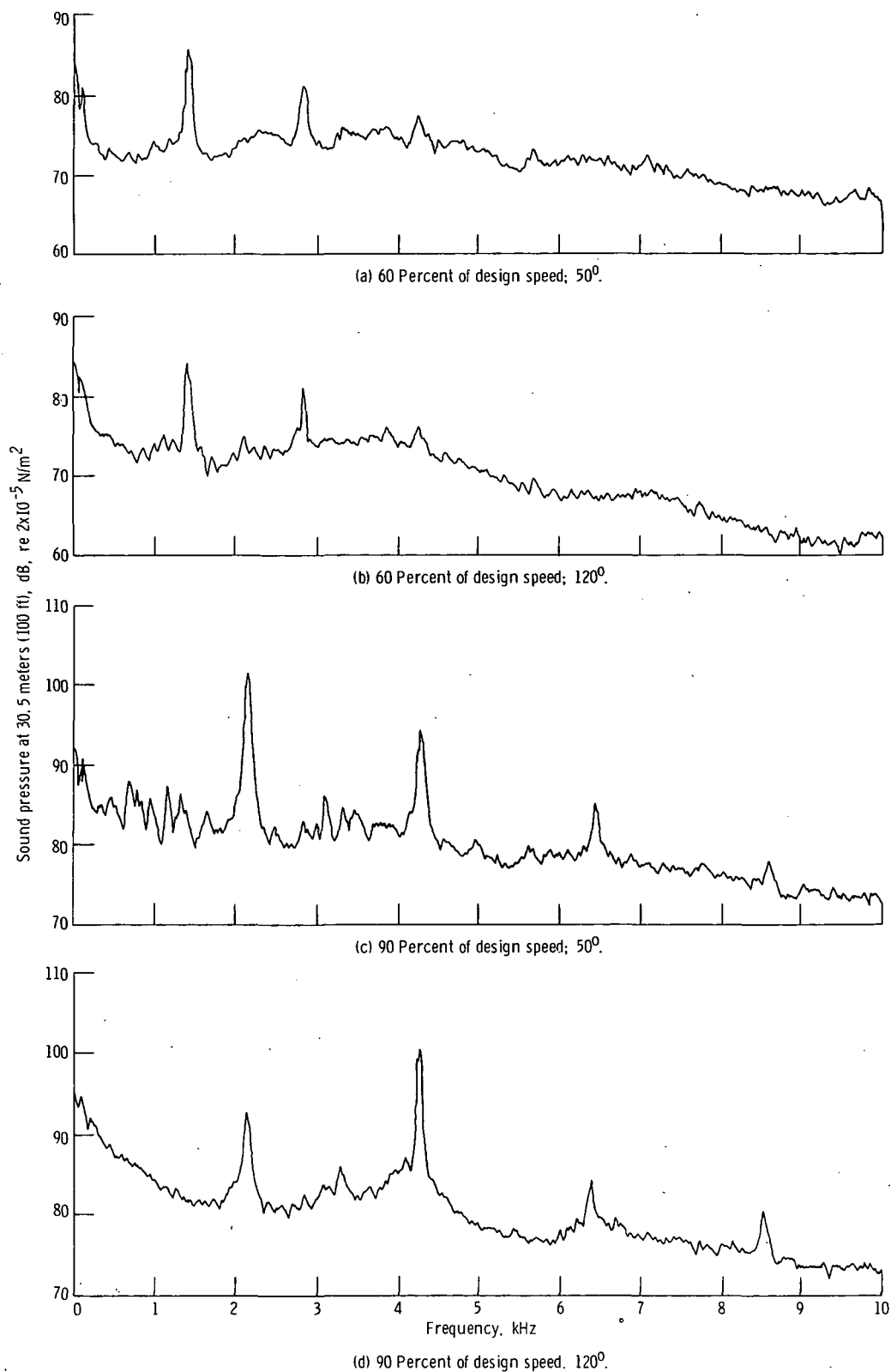


Figure 8. - Continuous 20-hertz constant bandwidth spectra at peak noise angles of 50° and 120° at 30.5-meter (100-ft) radius for configuration 206 (hard inlet, soft fan frame, hard exhaust, and nominal nozzle).

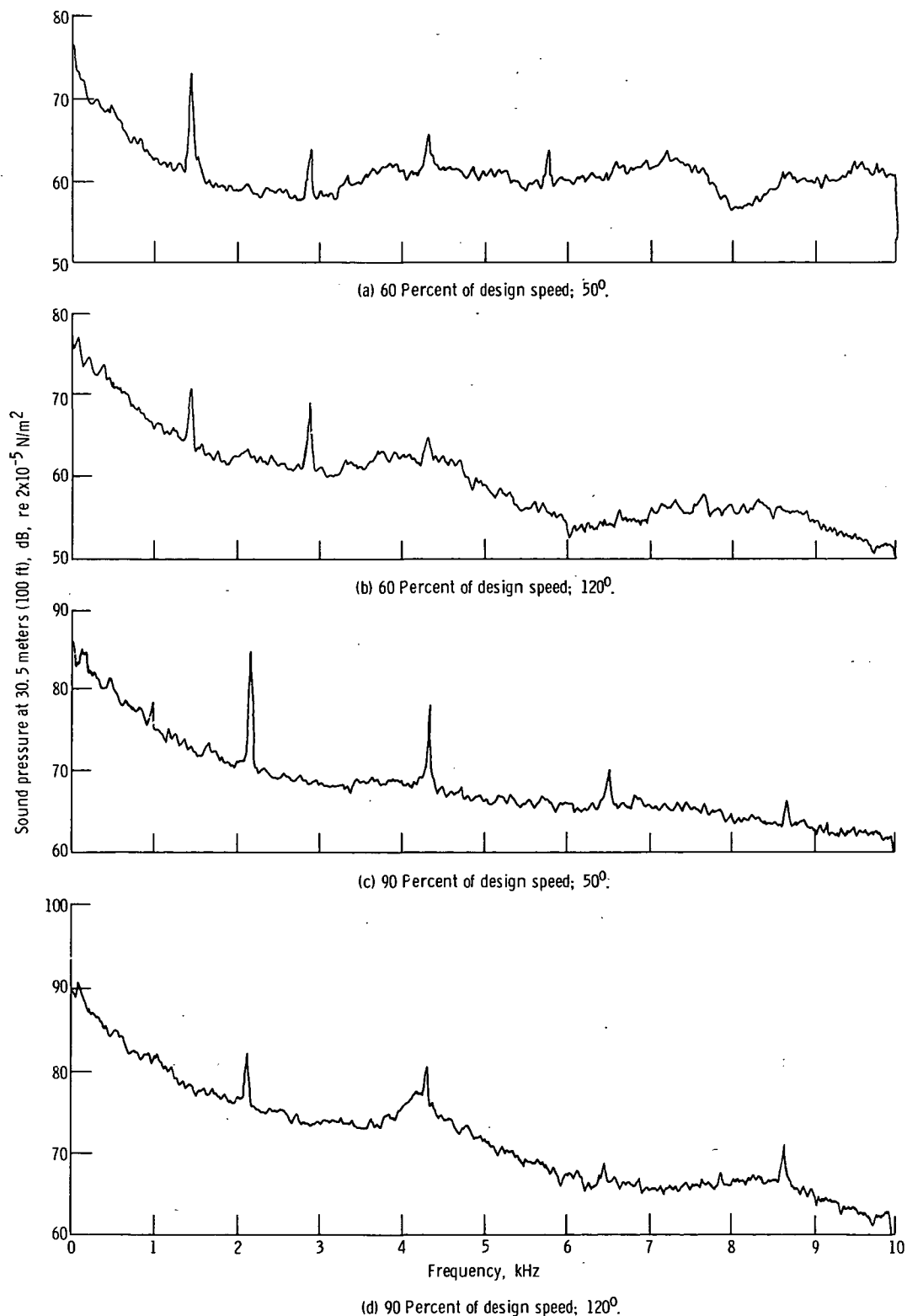


Figure 9. - Continuous 20-hertz constant bandwidth spectra at peak noise angles of 50° and 120° at 30.5-meter (100-ft) radius for configuration 208 (inlet suppressor, soft fan frame, exhaust suppressor, and nominal nozzle).



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